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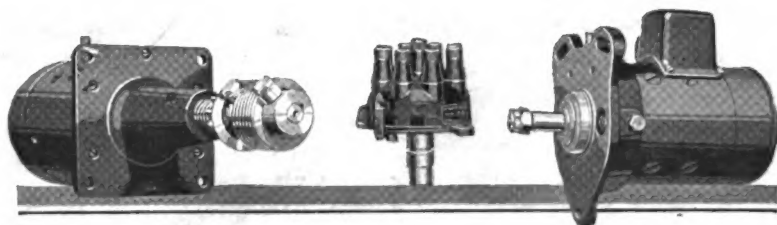
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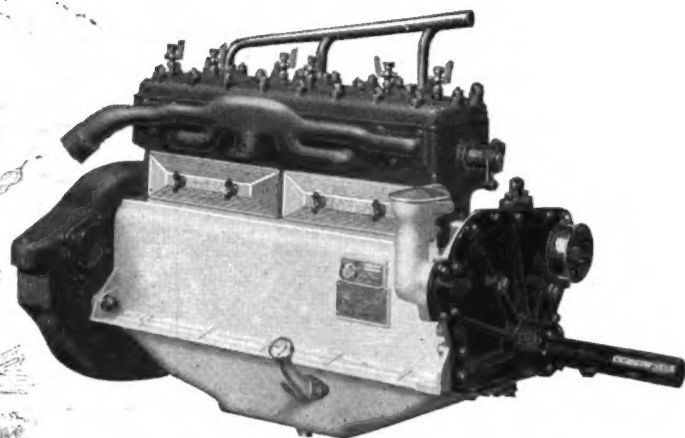
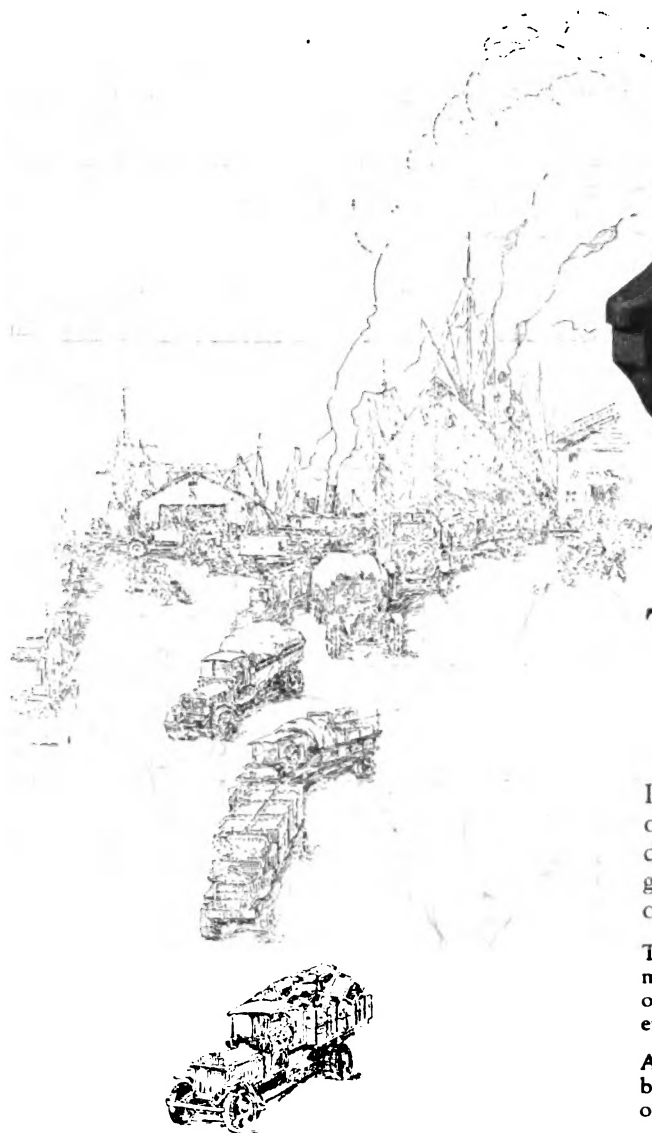
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AUTOMOTIVE INDUSTRIES

THE AUTOMOBILE

VOL. XLII

NEW YORK—THURSDAY, MARCH 4, 1920

No. 10

The Need for an Understanding of Labor and Industry

This article is a warning and a call for action to every man in industry to-day. Mr. Tipper shows the laxity of thought and the failure to study and advance that have left unsolved our economic, political and labor problems, a danger to present and future.

By Harry Tipper

DURING a conversation with a big industrial leader the other day, he remarked that, if a well informed industrial observer of Washington's time had been able to talk to an equally well informed observer of the time of the Ptolemies in Egypt, they would have revealed industrial methods sufficiently similar to bring their conceptions close together. On the other hand, if an industrial observer of Lincoln's time were to attempt to talk with a competent industrial observer of to-day, the difference in viewpoint would be so vital as practically to make conversation impossible. This statement struck me at the time as such a simple method of expressing the enormous changes pressed into sixty years of mechanical development that it indicates clearly some of the difficulties which must arise out of the rapid changes. It is another way of saying that, in a period of not more than a century, the industrial development has overturned not only the whole conception of industry, but the whole social and political existence have been revolutionized to the same extent.

In comparison with surroundings, however, human nature changes so slowly in its mental development that it seems to be static. Without understanding the significance of the phrase, we express it by the statement that human nature is always the same.

All the deep rooted traditions, the political sentiments and the habits of organization in social and

political life, refer back to the time before this development occurred and, as yet, we conduct our political organization, our jurisprudence and our social organizations almost entirely by the conception of rights and obligations which arose during those centuries. It is the attempt to adjust these slowly developing human organizations to the rapidly developing changes in the complexity of the mechanical equipment and surroundings of life that brings about the present plethora of theories, governmental experiments and mass actions with which we are struggling.

The ease with which we have been able to develop the mechanical equipment of life, so that we have arrived at a degree of comfort, far in advance of anything previously contemplated by the wildest of imaginations, has led us to forget that the very rapidity of these changes demands a study of the human side and a knowledge of human progress equally far in advance of that which was previously possessed. The fact is, however, that we have been immersed in the job of improving the mechanical equipment and in increasing the comfort and convenience of life to such a degree that we have almost neglected the study of the human side.

It is not without significance that our conceptions of philosophy, our ideas of logic, our traditions of

human organization remain almost unchanged since the industrial development began, and in not one of these fields has there been recorded any notable advance. In the meantime, the extremely rapid growth of interdependence which has come with the development of the mechanical arts and the specialization of occupation, calls for a degree of knowledge in human affairs and a degree of organization in the conduct of human affairs far beyond anything the world has seen heretofore. This very interdependence is capable of producing disaster just as great as its present advance in comfort and convenience of life. The great war was an illustration of the ease with which a small matter can be turned into a world-wide disaster by the very interdependent character of modern operations.

So long as we are content to accept the traditions of organization which belong to a different social existence, so long as we are content to adhere to methods of the industrial organization which belong to the same period, the whole of industry is in danger from the incapacity to understand and guard against the possibilities of disaster. The very fact that we are incapable of settling the agreements for production with a hundred or a few thousand men until they have interrupted the work of production or seriously threatened such an interruption, indicates our lack of capacity to understand the weakness of our own organization.

We seem to be equally incapable of interpreting the new economic and political theories of the workman's organizations and the newer political organizations. We showed considerable capacity in the protection of our system of comfort and convenience when it was threatened by the great war, *but we have shown little of that capacity in attempting to settle the terms of agreement when the actual conflict was over.* While industry needs larger facilities for transportation and more rapid communications, politics waits upon compromise for the individual and party agreements until the railroad system has become entirely inadequate for our industrial requirements and the transportation systems of our great cities are so far behind the necessities that they are crowded almost to the limits of human capacity for endurance.

As a matter of fact, the industrial observer of Lincoln's time and the industrial observer of to-day, of whom we spoke, would be no further apart than the industrial leader of to-day and his own workers. In so many cases that they constitute a considerable majority, the worker and the owner of the establishment find it impossible to converse in any language giving them a common ground of understanding.

Specialization of occupation and the great difference in the social surroundings, education and general tendencies have put the different classes of labor and management so far apart that it is almost impossible for them to get together without a deliberate and studious effort to arrive at the basis of understanding. As acute business men have observed more than once, it is up to the manager and the owner to understand his labor; it is not to be expected that labor will attempt to understand the manager or owner. Philosophic observers of history have indicated in their estimate of political requirements that it is up to the governors to understand the governed. That is the same thing. This means that it is up to the industrial manager or owner who would

arrive at a place where he can agree with his workers or get them to agree with him, to study a different language and a different set of ideals and a different conception of modern conditions than the ones in which he has been accustomed to think and act. He must be prepared to rid himself of his preconceived ideas on the matter and to develop from careful observation and study a knowledge of those significant usages in expression, in ideals, etc., which make words mean something entirely different to two men, although they may be expressed in the same tongue.

The complex machine of industry manages to move along despite stoppages and interruptions, and the fact that it is tied up with string in places where it should be linked with steel, but in respect of what is necessary for our continual advancement it is like the automobile of the earlier days. It is a wonderful instrument, the subject of pride to its observers, far in advance of anything previously conceived, but likely to stop by breakdown of one of its parts at a most inconvenient time under the most aggravating circumstances.

The only difference is that our present industrial organization is not weak particularly in its mechanical arrangement, but is weak because of our ignorance of human organization and the fundamental requirements of that organization under the rapid developments of the last few decades.

It is not long ago that a hard headed, shrewd, practical business man who has made a study of industrial history advanced the opinion that he was unable as yet to determine whether this mechanical civilization could continue indefinitely without a break. It has lasted long enough and developed far enough so that it cannot be dispensed with. The interdependence is here and, unless the machine operates within a reasonable percentage of capacity, a certain portion of the population of any industrial country must die. It has lasted long enough to justify our pride in its creation but, because of the slow development of human organization, it has not lasted long enough to justify the present methods of organization, and it is even now showing significant signs of weakness.

It is not enough that we should believe that the American Federation of Labor is incapable of solving the labor problem. It is not enough that we should feel that the socialist theory is unworkable. It is not enough to erect industrial relations departments and representative plans and even to prove our fairness to our individual employees. It is necessary that we should become interested in the national questions, in the political tendencies and in the social difficulties and in the methods in which they are being met.

The manager of a stone quarry said at a meeting the other day, "when I had approached my board of directors for \$36,000 for a new stone crusher, I got it without argument. When I asked for \$5,000 to better living conditions at the quarry I was refused. I could get along without the stone crusher but I must have the improved living conditions if I am to continue to have sufficient and careful labor."

Do not forget that the man working as a machinist in your employ is casting his vote as a citizen and is translating his belief or conception into his political expression. Do not forget that the children of this man are being educated in this era of interdependence by people who know little or nothing about modern industrial organizations, in subjects which are not applied to

anything in his life and with methods which perpetuate old traditions from a former social organization. It is well to remember that most of the voters of this country do not realize that their food for next month depends on a hundred thousand people working during this month and a half million more producing behind them. Most of them do not realize that the milk and refrigerator trains cannot reach their industrial city if there are not enough engineers, or if the engine needs replacement, or if there are not enough cars, plenty of tracks and terminal facilities and a constant incentive to keep work going on all down the line from the farmer to the driver of the wagon.

Socially, politically and industrially our present organization has changed too little to bring the intelligence of the people up in proportion to the necessities for intelligence in order to keep the machine going. We are only beginning to sense the difficulty now that the mass movements of labor and socialism have attained sufficient strength to become expressive and influential. We are only beginning to sense the fact that experiments of great importance are pending in respect to which we have no previous information and in respect to which our study has been practically nothing.

Industry can develop only in proportion to the development of the social and political organization.

starts with high page.
It can be halted by the actions of the voters and by the crude machinery of social government just as easily as it can be halted by its own internal difficulties. In fact, no decision can be made between internal and external difficulties. Every plan of general education, every question of political organization, every law of an economic character proposed by the Government, affects every industry and should be equally interesting to every industrial leader.

Year by year new experiments will be made and new organizations and suggestions introduced. Unless the industrial leaders begin to study human affairs and the political and social development, interesting themselves in every move of this kind, they will wake to find that they have been bound in red tape created by men who are powerful in politics or social life but without knowledge of industry and with little knowledge of the principles of human development.

There is no immediate danger in this country of revolutionary changes, but there is a great danger of continual experiment, entered upon in ignorance and conducted without efficiency, creating the very atmosphere out of which revolutionary proposals obtain their power.

Foreman Co-operation Essential to Efficient Production

ADDRESSING the men who have charge of employment, safety work and other branches of industrial relations at the principal plants within the Chicago industrial district, John Calder, manager of employees' relations, Swift & Co., said in part:

"In some plants I visit I know cases where workmen have a big grudge against their employers simply on account of the 'bullying' of some foremen or assistant foremen. Some executives and department heads are sore and not able to concentrate fully on their tasks because they are abused verbally and in other ways by men still higher. Government by fear and espionage is both despicable and futile. This is inexcusable folly. It kills all team-work and it lies at the bottom of a surprising amount of executive soreness and of labor unrest which manifests itself usually in extravagant demands often far removed from the actual causes. An employer is often misrepresented to his workers by his own foremen. You must also remember in your team-work that the bridge of words between you and your workers is frequently very weak and that ideas often fail completely to get over. Much of our poor work is due to the fact that the workman does not understand his orders.

"One factory I know of kept in its employment a very stupid man and the explanation the manager gave was that when he had a bulletin or instruction of general interest to issue he always tried it out on this man and when he was sure the stupid man understood it, he knew it was perfect.

"We must organize to restore personality in big business and we can only do it through the foremen. I saw a dog smell the third rail once. He was full of information in a moment, but he was a dead dog. He died of intensive education. Such a fate will not befall any foremen, I am sure. If an associated, enlightened group of foremen anywhere will tackle production problems and production people in the proper way I venture to say that industrial troubles will not prove insoluble and industrial good-will

will be restored. Healthy discontent is the normal American outlook, while all of our efforts should be toward eliminating the unhealthy kind based on untruth, ignorance, suspicion and abuse.

"Nobody was ever yet educated by merely 'pumping in' facts and opinions; unless there is a measure of 'drawing out' there is no education. To-day the whole world is intensely interested in modern production methods. Everywhere, even in prolific America, goods are scarce and are getting scarcer, and there is much cry about 'higher wages' but little or none about 'more work,' and it is only more work that will produce more things.

"You may remember that when Hinnissey asked Mr. Dooley, 'Is worruk a nicissiry evil?' the wise philosopher of Archy Road said, 'If it's nicissiry, it's not an evil, and if it's an evil, it's not nicissiry,' and David Harum reminded us that 'Fleas is good for a dog; they keeps him from thinking about being a dog.' What we call the 'Economic Urge' is a wise dispensation of Providence that keeps us always on the jump when things are not running as they should be."

THE Chamber of Commerce of the United States has announced the appointment of Chauncey D. Snow, former commercial attaché at Paris, as head of its new Department of Foreign Trade. The new department is one of several that are being organized as a means of dividing the work of the Chamber along lines of the great divisions of industry. The other departments to be created include industrial production, domestic distribution, transportation and communication, finance, insurance and civic development.

ACCORDING to reports at the Commerce Department, copper imports into the United States in 1919 fell off by more than 30,000,000 lb., compared with 1918. During last year 126,455,063 lb. of copper ore, valued at \$23,541,020, were imported, against 157,216,481 lb., valued at \$34,650,864, in 1918.

Packard Adapts Three Truck Models to Pneumatic Tires

An engine formerly used on a 5-ton design is placed in the new model Y, rated customarily at 3-ton capacity, in the change from solid tires, although no deviation from the former frame construction was considered necessary. This description shows how the Packard engineers have met the problem of the higher speeds attained in the new models so equipped.

By J. Edward Schipper

COMING at a time when the large pneumatic tired truck is one of the most important developments in the industry, the new Packard model Y is of unusual interest. Ordinarily, it would be rated as a 3-ton truck but, in accordance with the policy recently adopted by Packard of discontinuing capacity ratings, it is introduced under the symbol letter Y. It is designed for a maximum weight of 8000 lb. above the chassis, including the body and load, so that, in order to carry its normal capacity load, the body should weigh not more than 2000 lb.

However, it is now the policy of the Packard company to make first a study of the use to which the truck is to be put and then to furnish a truck suitable for that particular task. A light truck is able to carry a given load over fine, smooth roads, whereas, if the runs are through territory where the going may be rough and unfavorable conditions are encountered, a greater factor of safety is sought in the chassis and running gear and, consequently, a truck may be furnished that would ordinarily carry a greater capacity. Following this policy, the Packard company stamps on the name plate the data regarding the work the truck is to do and then, in case the truck is sold and passes into other hands, it must meet the approval of the Packard transportation engineer before the company will stand back of the machine and its performance.

To all intents and purposes, the new model is a 3-ton

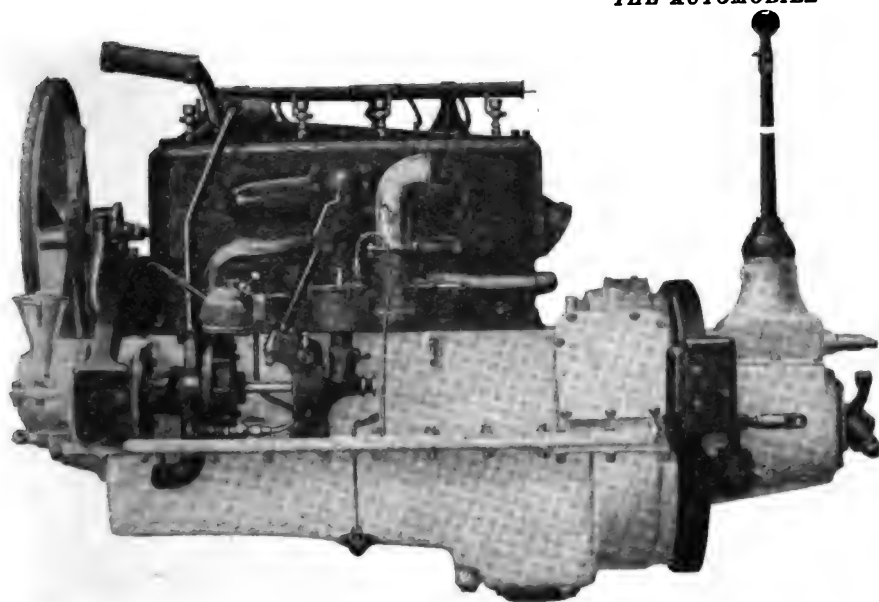
pneumatic truck and is comparable with other types of that capacity. An entirely new chassis and running gear has not been designed to take care of the pneumatic requirements. The problem has been analyzed as of a two-fold character, namely, the dead weight carrying unit and the propulsive unit. In shifting from solids to pneumatics, it is the belief of the Packard engineers that nothing has been done to influence the weight carrying factors and hence they remain the same. In other words, the frame design of the 3-ton pneumatic job is the same as that of the 3-ton solid. On the other hand, the propulsive units have been altered as regards the powerplant in order to take care of the higher speeds at which the pneumatic vehicle will travel and to provide the same ability at the rear wheels with the larger diameters due to pneumatics.

To meet this problem, the same engine as is utilized in the 5-ton solid-tired truck has been placed in the 3-ton pneumatic and the governor speed has been increased from 1100 to 1600 r.p.m., giving a maximum truck speed of 24 m.p.h. The changes in the engine to adapt it for use on a 3-ton pneumatic-tired truck have been solely in the governor. Contrary to what would generally be expected, the gear ratios in the box have not been altered and the worm drive remains 9 to 1. The pneumatic tires carried by these trucks are 44 x 10 in. rear and 38 x 7 in. front.

The 5 x 5½-in. engine is a block cast four, with an S.A.E. rating of 40 hp. It is a solid head type with an aluminum crankcase, having a four-bearing crankshaft, and is a heavy duty product throughout. The iron pistons are 5¾ in. in length and are heavily ribbed. The piston



Packard Y or 3-ton pneumatic truck with test load

*Left side of Packard truck engine*

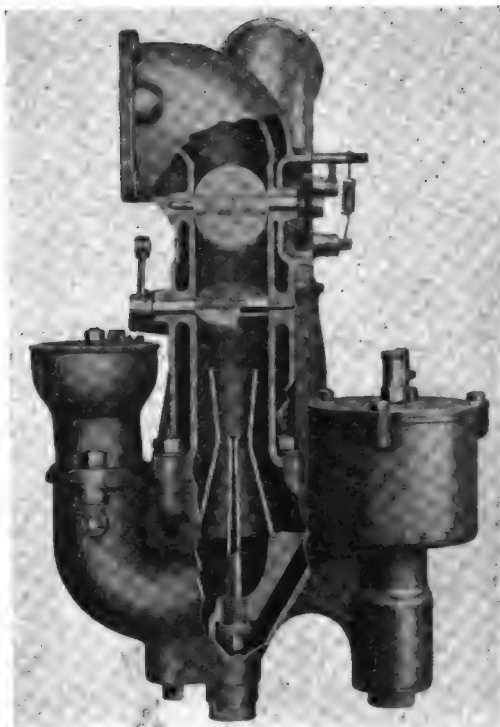
pin is clamped in the piston bosses and the bearing is formed in the upper end of the rod. There are three piston rings, all at the top of the piston, these being $\frac{1}{4}$ -in. rings, $\frac{3}{16}$ in. thick. The pistons are fitted to the cylinders by selection to give a clearance of 0.003 in. on the bottom of the skirt and 0.005 in. below the lower ring grooves. The piston pin is also a selective fit with the connecting rod bushing and so assembled as to obtain 0.00025 to 0.0005 in. clearance. The pin has $1\frac{1}{4}$ in. outside diameter and is $4\frac{5}{8}$ in. in length.

The connecting rod is $11\frac{3}{4}$ in. long. It is of I-beam section and so designed that the center line of the shank is $\frac{3}{16}$ in. away from the center of the cylinder. This arrangement permits of larger size main bearings and increased water space between the cylinders. The crankpin bearing is $2\frac{1}{4}$ in. in diameter and $2\frac{1}{2}$ in. in length. These bearings are bronze backed, babbitt lined. End clearance of the crankpin bearings is held down to 0.003 in. in manufacture, and is not allowed to exceed 0.005 in. after test. The connecting rod and bushing assembly is a selective fit with the crankshaft, with a clearance of from 0.001 to 0.002 in. The weight of the piston complete and the upper end of the connecting rod is kept within a limit of variation of $\frac{1}{2}$ oz. for the complete set.

The crankshaft is not counter-weighted but is exceedingly stiff, being $2\frac{1}{4}$ in. in diameter and having a total projected bearing area of 29 sq. in. The bearings are all $2\frac{1}{4}$ in. in diameter, the front bearing being 3 in. long, the two center bearings $3\frac{1}{16}$ in. each, and the rear bearing $3\frac{3}{4}$ in. The total projected area of the connecting rod bearings on the crankshaft is 22.5 sq. in. All of the crankshaft main bearings are die-cast, of the bronze-backed type. End play on the crankshaft is taken care of by flanges on the center main bearings; it is held to 0.001 in. in manufacture, and to 0.004 in. after test.

The camshaft is a helical-gear driven, integral forging mounted on four-bearings. The front bearing and the two center bearings have a diameter of $2\frac{7}{16}$ in., the rear bearing being $1\frac{1}{2}$ in. The lengths of the camshaft bearings are $2\frac{15}{16}$ in. for the front, $1\frac{1}{2}$ in. for each of the two intermediate bearings, and $1\frac{3}{8}$ in. for the rear. This gives a total projected area of 16.55 sq. in. for the camshaft.

The valves are actuated by roller followers. The tappets are hollow and carry adjusting screws with check nuts for adjusting the valve stem clearance. Tappet guides are set into holes in a flange on the cylinder block

The carbureter used on Packard truck engine

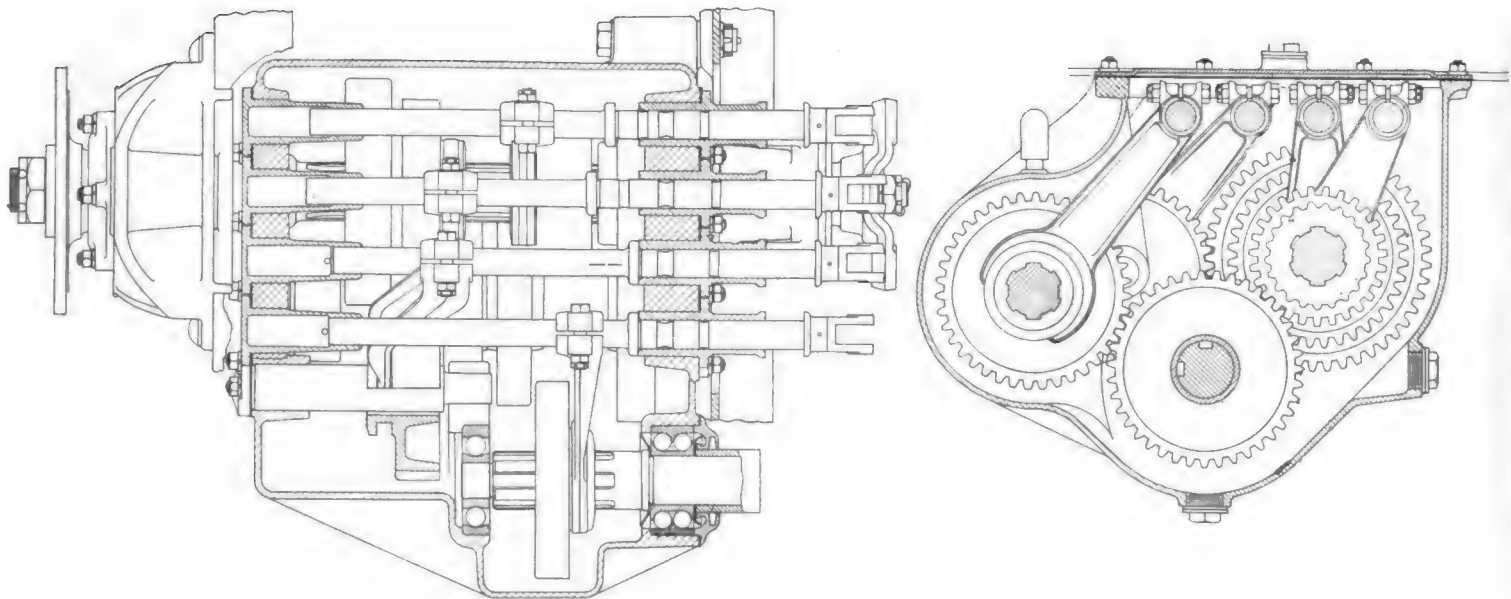
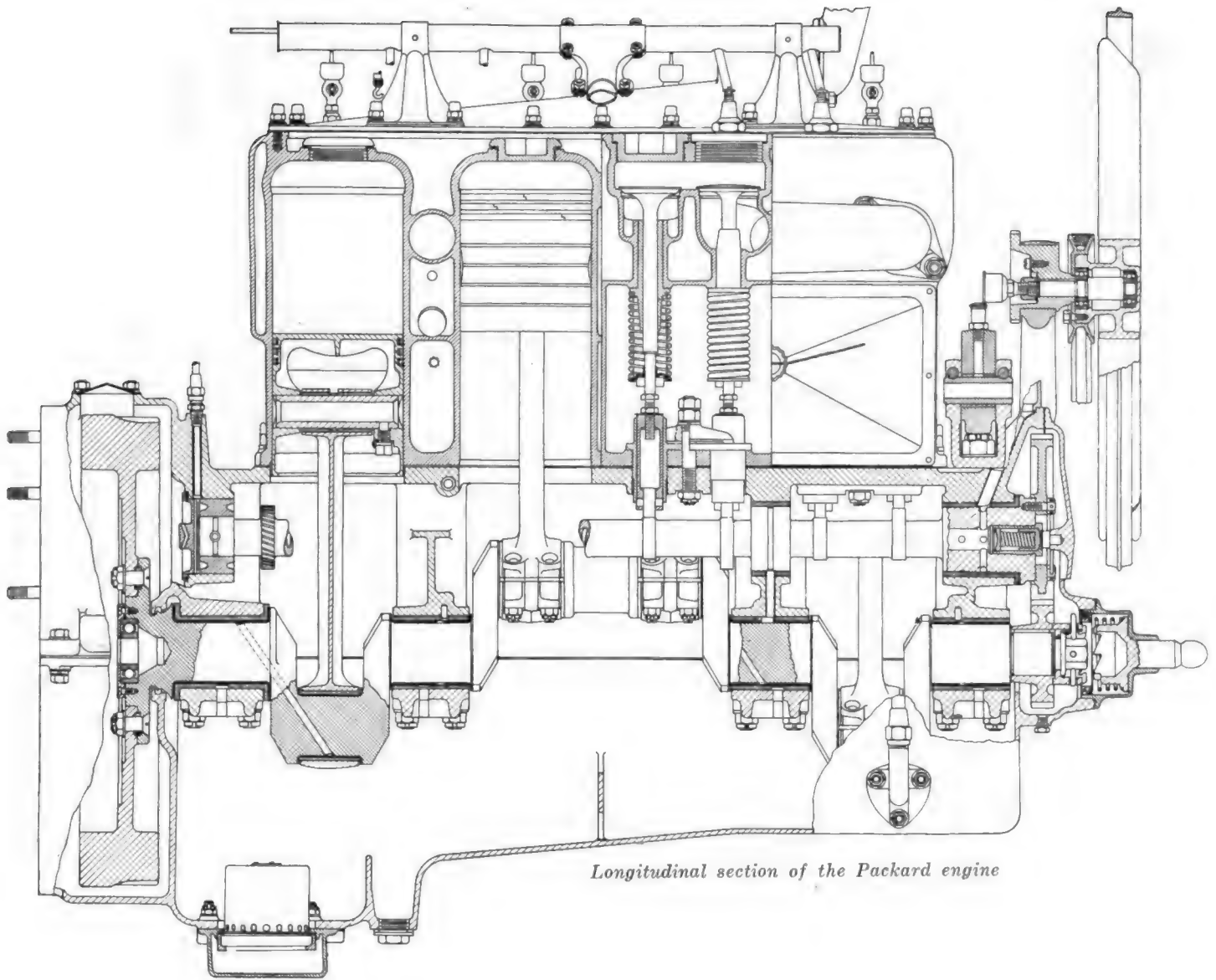
and in the crankcase and are held down by crowfoot clamps. The inside diameter of the guide is 1 in. and the length $2\frac{1}{2}$ in. The valves have a clear diameter of $2\frac{1}{2}$ in. and a $\frac{5}{8}$ -in. stem, which is reduced to $\frac{3}{8}$ in. in diameter at the lower end. The valve stem guides are cast iron of $4\frac{1}{4}$ in. in length. The clearance between the inlet valve stem and guide is from 0.002 in. to 0.0045 in. and the clearance between the exhaust valve stem and its guide is 0.0085 to 0.011 in. The inlet and exhaust valve tappet clearances are 0.016 in. when the engine is warm. That is, at a temperature of 170 to 180 deg. Fahr.

Oiling is by pressure to the crankshaft, camshaft and timing gears and by spray to the pistons and upper rod bearings. The oil is circulated by a horizontal plunger pump driven by an eccentric off the camshaft. The pump is set horizontally on the right side of the engine and is removable for inspection by taking out the retaining cap screws. The oil reservoir has a capacity of $3\frac{1}{4}$ gal.

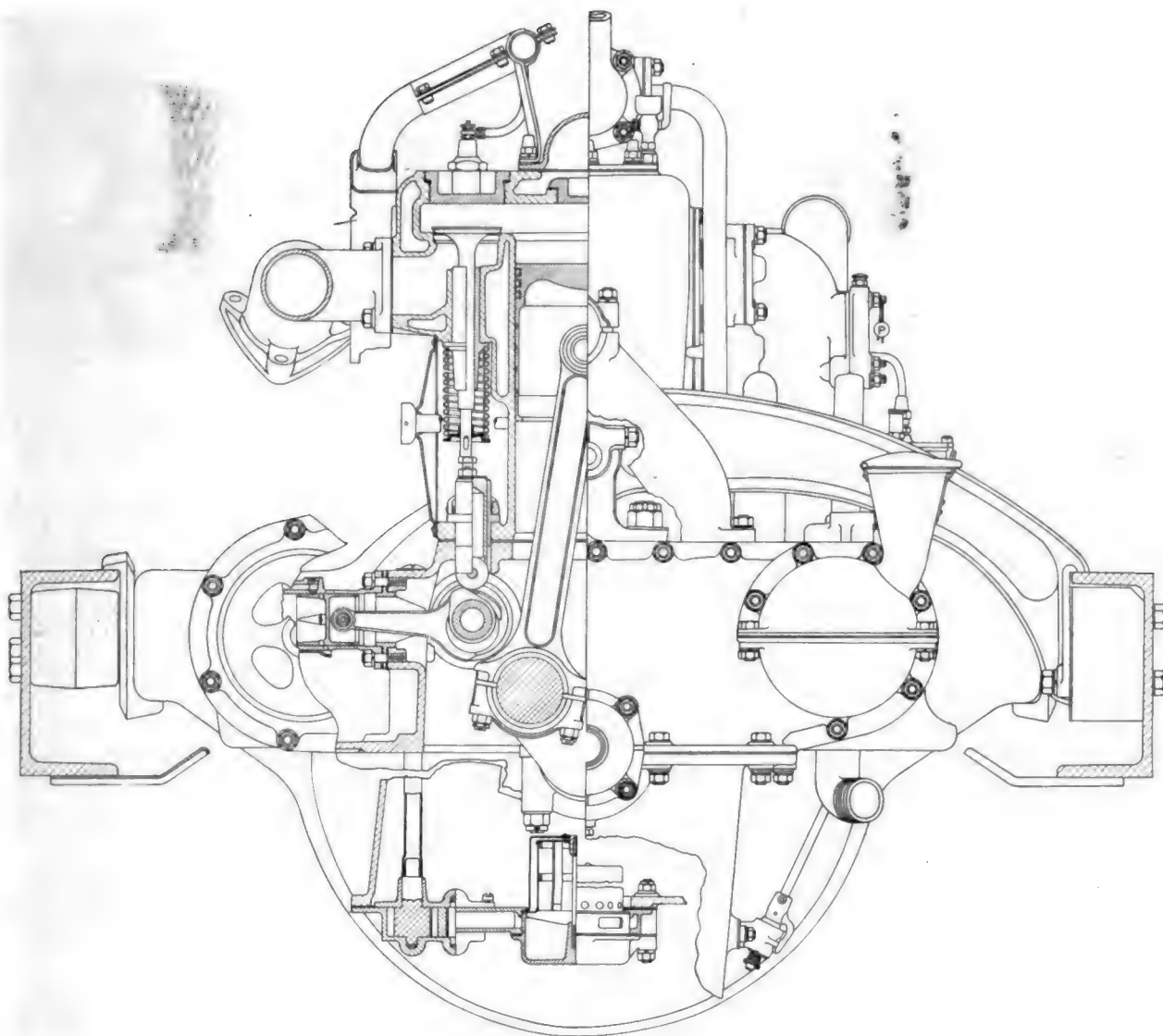
The cooling water is circulated by a centrifugal pump driven off the governor shaft, and the circulating line incorporates a Sylphon thermostat mounted in the water header, allowing the water to be by-passed around the jacket until the running temperature is attained. There are two points of water intake, these being located between the first and second and between the third and fourth cylinders on the left side of the block. The water is guided around to the right side on which the valves are located. A feature of the engine is the large jacket space around the heads of the cylinders and between the cylinders themselves. There is also an exceptional amount of water around the valves, as will be apparent from the sectional views of the engine. The capacity of the water system is $9\frac{3}{4}$ gal.

Gasoline is fed by pressure to a Packard carburetor of the plain tube, fixed Venturi type. This is a water-jacketed unit with a single nozzle. The governor throttle is located above the hand-operated throttle and is controlled by a fly-ball type of governor set to operate at 1600 r.p.m.

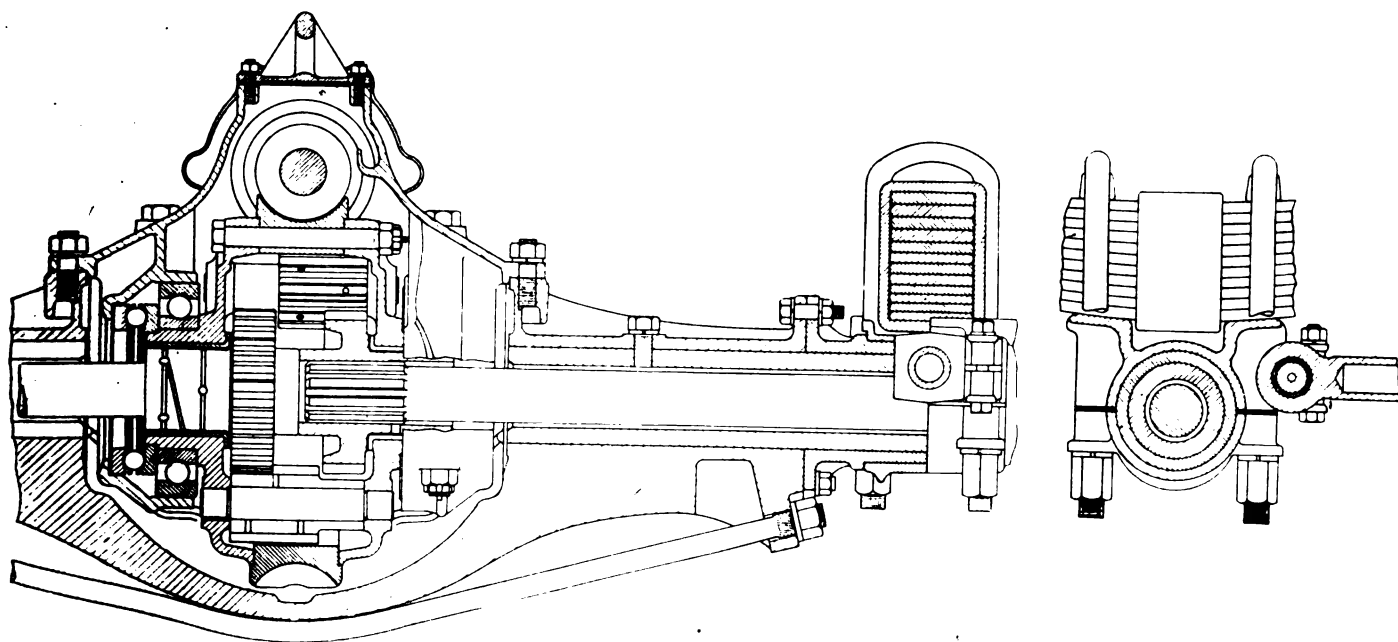
The clutch is a dry disk unit with five disks, the driving disks being covered with woven asbestos material on both sides. The clutch spring surrounds the shaft and the end thrust is taken by annular ball bearing. The gearset is a four-speed, selective type, mounted amidships. The



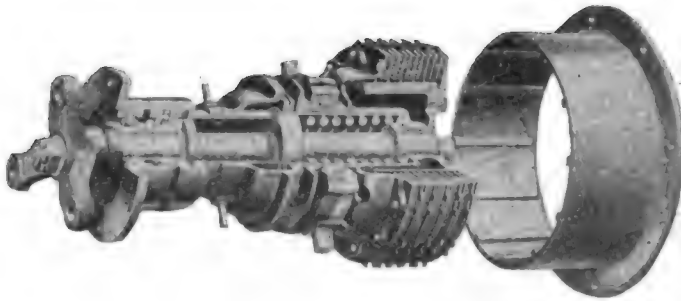
Parts section and cross section of the Packard gearset assembly



Plan and section of the Packard engine

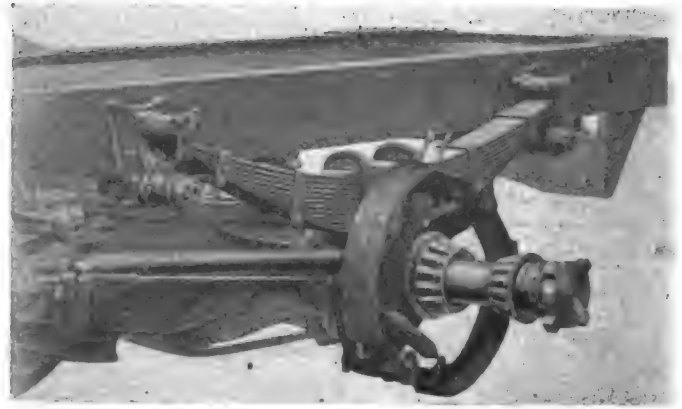


Longitudinal section of the rear axle assembly



Dry disk type of clutch used on Packard pneumatic truck

To the right—Rear spring and wheel mounting on Packard truck



main shaft is carried on four annular bearings. The reductions to the gearbox are as follows: high, 1 to 1; third, 1.48 to 1; second, 2.56 to 1; first, 4.6 to 1; reverse, 6 to 1.

The final drive is by an overhead worm with a 9 to 1 ratio. The differential is a spur gear type, concentrically mounted within the worm wheel. The minimum diameter of the rear axle driving members is $1\frac{7}{8}$ in. The tread from center to center of the rear wheels is $68\frac{5}{8}$ in. and on the front wheels is $69\frac{3}{8}$ in. The tire sizes are 44 x 10 in., rear, and 38 x 7 in., front. It is in the tire size that the real reason for the larger capacity engine exists. Owing to the great increase in the outside diameter of the pneumatic over the solid-tired wheels, the ability of the truck drops off. To restore it to the same value as with the solid-tired truck, the larger engine is used.

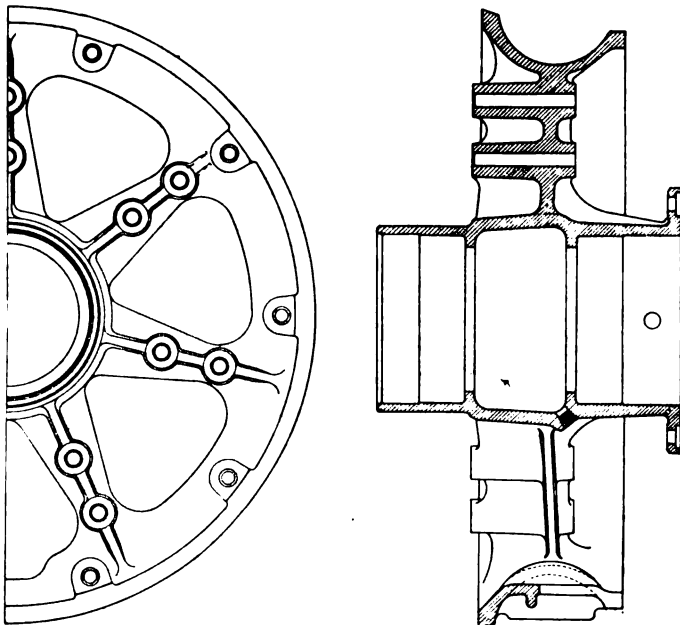
The rear axle torque is taken by a torque arm mounted on the axle housing just forward of the worm wheel and below the worm case. The forward end of the torque rod is connected with a frame cross-member. The truck is driven through radius rods; the frame is of channel construction, the depth being 6 in., the flange width 2-13/16 in. and the weight of the channel 13 lb. per foot. The front axle is an I-beam, $2\frac{1}{2}$ x $3\frac{1}{4}$ in. The road clearance is $13\frac{3}{4}$ in. and the point of least clearance is at the center of the rear axle. The springs are semi-elliptic, the front being 3 in. x $42\frac{3}{8}$ in., and the rear 3 in. x 46 in. The spring bolts are all $\frac{7}{8}$ in. With a 13-ft. wheelbase, the truck has a turning radius of 28 ft. and with a 15 ft. 6 in. wheelbase a turning radius of 33 ft. The wheels are cast

steel with six spokes in front and seven spokes in the rear. The foot brake is an external type, mounted on the drive shaft, the hand brake being an internal rear wheel type.

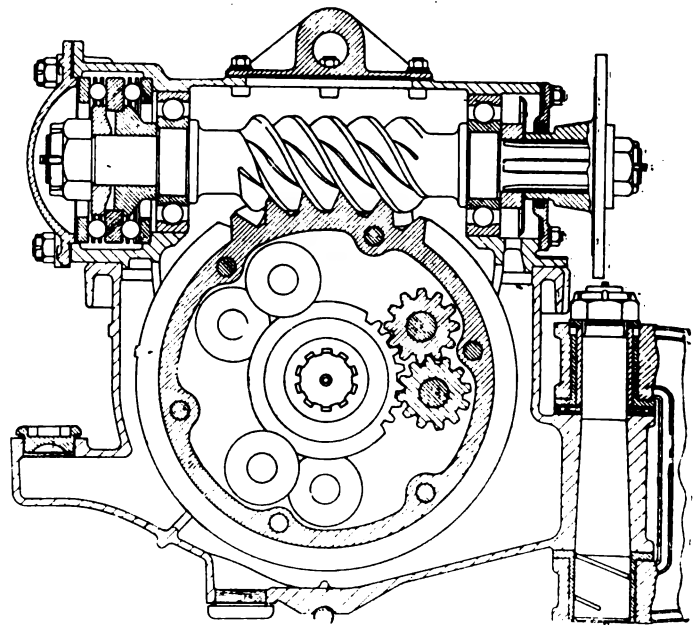
The chassis weight of the 13-ft. wheelbase truck is estimated at 7250 lb. Of this 3450 lb. is on the front wheels and 3800 lb. on the rear. With a body weighing 1000 lb. (the maximum body allowance), the total weight is 9250 lb., of which 3650 lb. is on the front wheels and 5600 lb. on the rear. In the case of the $15\frac{1}{2}$ -ft. wheelbase chassis with full weight body, the total weight is 9360 lb., of which 3650 lb. is on the front wheels and 5710 lb. on the rear.

In addition to the model Y described, the Packard company is making two other pneumatic tired trucks. These are $1\frac{1}{2}$ - and 2-ton capacity, thus giving a range of three models. Modifications for each have been made from solid-tire practice in the way of wheel equipment and means for inflating the giant pneumatic tires. The tire sizes are in accordance with the S.A.E. capacity ratings, or larger. The rim equipment is of the demountable type provided for the purpose of facilitating the handling of the giant size tires.

In order to make the handling of tires as easy as possible, metal wheels of the spoke type have been employed, this construction permitting the use of a slot in the rim for the valve stem. With this slotted rim, it is possible to assemble the tire on the wheel by rolling it into position rather than by sliding it over the wheels and instead



Half plan and section of wheel



Longitudinal section of worm assembly

1½-TON MODEL BODY DIMENSIONS

Wheelbase		LENGTHS			WIDTHS			Heights (Not Loaded)		
		Std.	Min.	Max.	Chassis Overall	Body Overall	Body Clear	Truck Overall	With Top	Body Floor at Rear
12-0	Body Clear.....	10-2½	8-0½	11-8½						
	Back of Seat.....	10-6	9-1	12-0	5-10½	5-5½	5-0	5-11	7-11½	3-11
	Truck Overall....	17-11½	16-6¾	19-5½						
14-0	Body Clear.....	13-8¾	11-8¾	15-8¾						
	Back of Seat.....	14-0	12-0	16-0						
	Truck Overall....	21-5½	19-5½	23-5½						

of the more difficult method of lifting the tire and rim assembly for the purpose of inserting the valve stem through a hole in the rim.

In providing for the proper ability without employing high motor speeds, it has been found necessary to equip the 1½- and 2-ton models with the 4-3/16 x 5½ in. engine. Ample radiating capacity has been provided by using the same size radiator on the 3-ton pneumatic tired truck as with the same size engine on the 5-ton solid.

On the 1½-ton pneumatic chassis, the maximum allowable weight above the chassis, including the body load, is 4250 lb., giving a body weight of 1250 lb., which must not be exceeded in order to carry capacity load. The 1½-ton pneumatic truck has the standard Packard 30 m.p.h. axle gears, giving a ratio of 7 to 1 in high at 30 m.p.h., 10.4 to 1 on third at 20.2 m.p.h., 18 to 1 on second at 11.68 m.p.h., and 32.14 to 1 at 6.53 m.p.h. On first, the gear ratio is 42.2 to 1, giving a speed of 5 m.p.h.

The tire equipment on the 1½-ton size is 36 x 6 in., front, and 38 x 7 in., rear. It has a tread of 56 in. at both front and rear and a turning radius on the 12-ft. wheelbase chassis of 23.5 ft., and on the 14-ft. wheelbase of 25.5 ft. The wheels are of the metal spoke type, both front and rear having six spokes. The engine is a four-bearing crankshaft job, having a total projected area of the crankshaft bearing of 24.3 sq. in. and on the connecting rod bearings, measured on the crankshaft, 19.125 sq. in. The crankshaft is 2½ in. in diameter. The frame is channel structure, 6 in. in depth with 1-59/64-in. flange width and a weight of channel per foot of 8 lb. This truck has a clearance of 12½ in. from the bottom of the rear axle to the ground.

The 2-ton truck has a maximum allowable weight above the chassis, including body and load, of 5500 lb., allowing a 1500-lb. body to carry capacity weight. This truck is designed with a 27 m.p.h. axle, giving on high gear of

2-TON MODEL BODY DIMENSIONS

Wheelbase		LENGTHS			WIDTHS			Heights (Not Loaded)		
		Std.	Min.	Max.	Chassis Overall	Body Overall	Body Clear	Truck Overall	With Top	Body Floor at Rear
12-0	Body Clear.....	10-7½	8-8½	12-1½						
	Back of Seat.....	11-0	9-1	12-6	6-2½	5-7¾	5-0	6-2½	8-1	4-2½
	Truck Overall....	18-6½	16-7½	20-0½						
14-0	Body Clear.....	13-7½	12-1½	15-7½						
	Back of Seat.....	14-0	12-6	16-0						
	Truck Overall....	21-6½	20-0½	23-6½						

3-TON MODEL BODY DIMENSIONS

Wheelbase		LENGTHS			WIDTHS			Heights (Not Loaded)		
		Std.	Min.	Max.	Chassis Overall	Body Overall	Body Clear	Truck Overall	With Top	Body Floor at Rear
13-0	Body Clear.....	11-7½	9-7½	13-1½						
	Back of Seat.....	12-0	10-0	13-6	7-4	6-7¾	6-0	6-7	8-5	4-7
	Truck Overall....	19-10½	17-10½	21-4½						
15-6	Body Clear.....	15-7½	13-1½	18-1½						
	Back of Seat.....	16-0	13-6	18-6						
	Truck Overall....	23-10½	21-4½	26-4½						

27 m.p.h. a ratio of 8 to 1. On third speed it has a ratio of 11.8 to 1, which gives 18.3 m.p.h. On second it is geared at 20.57 to 1, with a speed of 10.5 m.p.h., and on low, 36.7 to 1, with a speed of 5.9 m.p.h. On reverse, the gear ratio is 48.2 to 1, which corresponds with 4.5 m.p.h.

The tires utilized on the 2-ton truck are 36 x 6 in., front, and 40 x 8 in., rear. The tread from center to center of the front wheel is 58½ in. and at the rear 55½ in. The turning radius of the 2-ton truck is 24 ft. on the 12-ft. wheelbase and 26 ft. on the 14-ft. wheelbase. Both the front and rear wheels are of the metal spoke type, having 6 spokes. The clearance is 12½-in. minimum, this distance being from the bottom of the rear axle to the ground.

The engine is a four-bearing type with a total projected area of 24.3 sq. in. on the crankshaft. The crankshaft diameter is 2½ in. The total projected area of the connecting rod bearings is 19.125 sq. in.

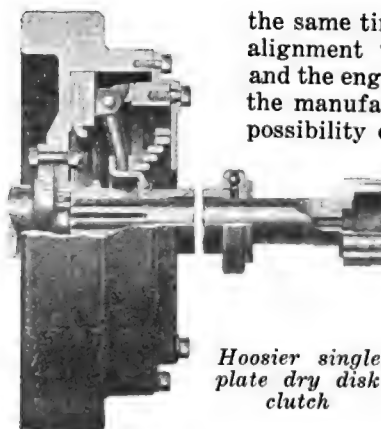
Any standard bodies may be mounted on these chassis and a tabulation is given herewith of the standard body dimensions on the 1½, 2 and 3 ton trucks.

Non-chattering Clutch

THE illustration gives but a general idea of the clutch referred to in the title, but there are a number of special features which can be explained without the use of a diagram. In the first place, the makers claim for this device an easy and simple adjustment of the friction disks to compensate for wear. The rapid and positive disengagement is said to eliminate any tendency to drag when releasing.

Powerful leverage is afforded by three clamping levers, the design making possible the use of lighter springs than usual in this type, resulting in an easy operation of the pedal.

Another feature is the special design of the disengaging sleeve with its spherical seat within the clamping lever collar, providing equal pressure on all three levers, and at



Hoosier single plate dry disk clutch

the same time taking care of any misalignment between the transmission and the engine. This is accomplished, the manufacturers state, without any possibility of binding on disengaging sleeve, thus making a full-floating sleeve. The lever seat centers the pressure plate to which the levers are attached, the object being the elimination of brake chatter. The clutch is manufactured by the Hoosier Auto Parts Co.

Duesenberg Racing Design Continued in Rochester Engine

Production has commenced of this modified power unit, it being used on Meteor, Revere and Roamer cars. The engine has the characteristic horizontal valve action of the Duesenberg product and only a few changes have been made on it. This article details its salient features.

WHEN the Duesenberg Motors Corp. was taken over by the Willys Corp., an arrangement was consummated whereby the manufacturing rights for the 4 x 6 in. Model G Duesenberg engine were obtained by the Rochester Motors Co., Inc., a firm that for several years had been building airplane parts for Curtiss and other companies. Before production was started at the Rochester plant, several changes were made in the Model G engine, some of which were suggested by Fred S. Duesenberg, the original designer of the engine.

The Rochester company is now in production on this engine and it is being used in the Meteor, Revere and Roamer cars. It is a development of the Duesenberg racing type that has been seen on the speedways during the past five years. The engine has the horizontal valve action characteristic of all the Duesenbergs and is cast en bloc. The ends of the water jacketing are left open and aluminum end plates, fastened with cap screws, permit easy access to the water jacket for cleaning out sediment. They also facilitate the setting of cores and insure uniform wall thickness of the casting.

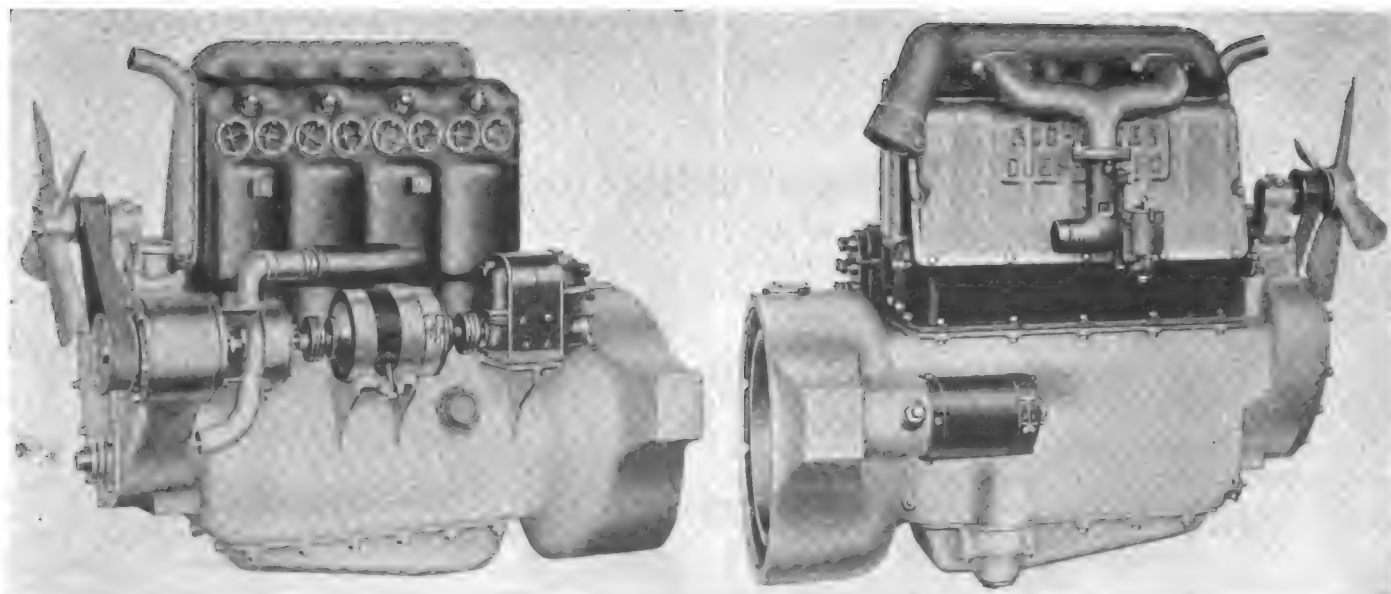
The pistons are Magnalite aluminum alloy of rather heavy section for heat transmission, but still are light in weight. The head is particularly heavily ribbed to dissipate heat and to insure uniform expansion. There are three piston rings, the Burd high compression type used on top and two American hammered rings underneath. The piston pins are Shelby steel tubing, hardened and ground.

The drop forged, chrome vanadium I-beam connecting rods have the piston pins clamped in the upper end with the bearing formed by the piston boss. The big end bearing cap is fastened with four bolts and the bearings at this end are bronze, babbitt lined, removable and adjustable.

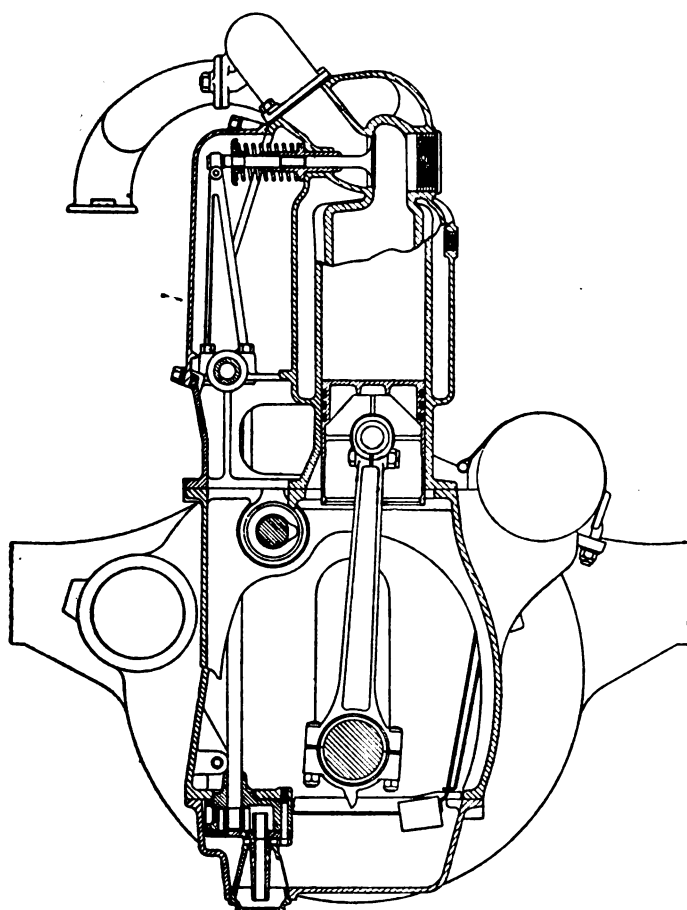
The two-bearing crankshaft is of Wyman & Gordon counterbalanced type with crankpins and main journals 2-5/16 in. in diameter. The checks are drilled diagonally from the main bearings for pressure feed lubrication. The main bearings are bronze, babbitt lined and are removable and adjustable.

In the aluminum one-piece crankcase, the front bearing is integral with the crankcase and lined with a babbitt-bronze, one-piece bushing. The rear bearing is split for adjustment and is contained in a conical aluminum housing, which in turn is accurately fitted and bolted to a recess in the crankcase. The crankcase is ribbed generously throughout, the entire assembly being designed particularly for rigidity and accuracy in alignment. The oil pan also is of aluminum and is bolted to the crankcase.

The camshaft, water pump, generator and magneto are driven by a silent chain from the crankshaft. The chains and gears are the product of the Link-Belt Co. The camshaft is carbon steel, drop forged with cams and helical pump gear integral, the camshaft bearings being Non Gran bronze. The intake valves are carbon steel, 2-3/16 in. diameter. The exhaust valves are of the same diameter, but of tungsten steel. The valve spring retainer



Rochester-Duesenberg engine

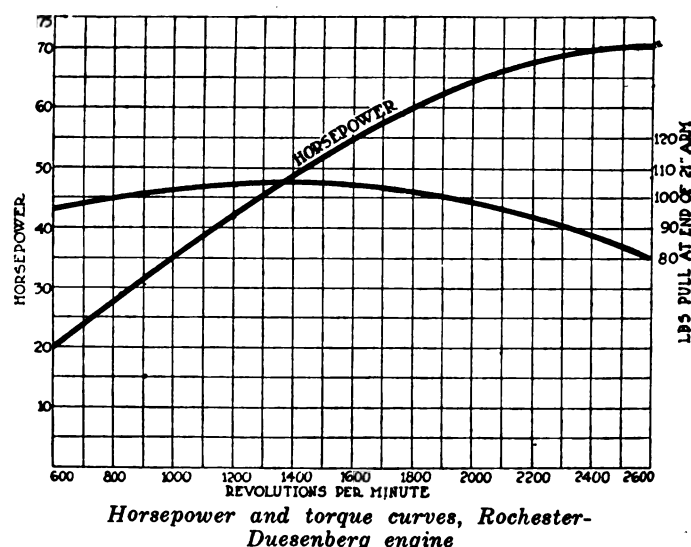


Cross sectional view of Rochester-Duesenberg engine

is secured by means of a split taper cone and the valve rocker arms, actuated in the customary Duesenberg manner, are drop forged, nickel steel with a cam roller at the lower end and an adjusting screw at the upper end. The fulcrum bearing is bushed with Non Gran bronze. The

rocker arm shaft, which carries all of the rockers, is Shelby steel tubing, hardened and ground. Each shaft supports eight rocker arms and the entire valve actuating mechanism is enclosed in an oil-tight chamber with a removable cover plate. Lubrication is by pressure feed to the main connecting rod, camshaft and rocker arm bearings. Overflow from a relief valve in the pressure line feeds the silent chain, timing gears and pump shaft. The pistons, piston pins, cams and cam rollers are lubricated by the spray from the upper end of the rods. Cooling is by an impeller type of circulating pump and for carburetion and gasoline feed any standard units can be applied. The engine is also adapted to take standard mountings for generators and starting motors. Ignition can also be by any of the standard applications.

The performance of the engine is shown by the accompanying horsepower and torque curves. They indicate a maximum of 70 hp. at about 2600 r.p.m. and maximum torque of 105 ft. lb. at between 1200 and 1500 r.p.m. The curves were made with a 1½-in. Stromberg carburetor, Bosch magneto and Rajah spark plugs.



Dynamometer Tests at Lincoln Tractor Trials

AT the time of the autumn tractor trials at Lincoln, England, J. E. Martin, of the Hyatt Roller Bearing Co., went to that country with the firm's traction dynamometer and it was generally understood then that he was to have charge of the dynamometer tests. Later, when it was learned that a dynamometer built by the National Physical Laboratory was used for nearly all the tests and when no mention was made of Martin and his dynamometer, in reports of the trials, considerable curiosity was expressed regarding the arrangements that had existed between Martin and the trials management. This matter is now cleared up by a letter received from H. Scott Hall, who was organizer of the exhibition.

Hall writes that at the time he took over the organization of the trials, two tentative inquiries have been made by the committee among British manufacturers of draw-bar dynamometers to ascertain if a dynamometer with recording apparatus were in existence. These inquiries led to no definite results. Being aware that the Hyatt company had such an instrument, which they were accustomed to demonstrate at tractor meetings, he wrote that concern asking if it would lend him the dynamometer. In the meantime search for an English recording dynamometer was continued, and, between the time the letter to the Hyatt company was mailed and a reply received from it, Hall succeeded in getting the National Physical Laboratory to complete an instrument, portions of which were already in existence.

After the laboratory had started its work Hall received an offer from the Hyatt company that it not only would send the instrument, but also a man to supervise and operate it. As there were from 30 to 40 tractors to be tested in the short space of two days, Hall decided to accept this offer, and Martin went to England to assist in the tests.

It happened that the instrument made by the National Physical Laboratory proved to be rather better suited to the particular work at Lincoln than that of the Hyatt company, for the reason that the records on the British machine were taken on a continuous roll of paper. Thus the tests could be continued right along, whereas on the Hyatt instrument a new sheet of paper has to be fitted between succeeding tests. Considerable use was made of the Hyatt instrument for testing soil resistance in the various fields, for which purpose the British machine was practically useless.

Analysis of German Trucks by the Motor Transport Corps

This article continues the report on the trucks surrendered to the A. E. F. under the terms of the armistice. The results of the investigations and tests are being made public as rapidly as they are completed for each truck.

By C. R. Hays*

Durkopp

THE engine is a four-cylinder, with $4\frac{1}{2}$ x $5\frac{1}{2}$ in. bore and stroke; four point suspension; suspension from the upper half of the crankcase. The cylinders are cast in block with right-hand valves with exhaust ports tapered to the rear of the motor with five sq. in. of area. The carbureter intake on the left side of the engine runs through to the right side forming a Y shaped passage leading to two adjoining intake valves. The water enters on the front end of the engine, flowing around valve seats and guides to the rear of the engine where it returns and circulates around the cylinders, rises and is discharged through a two-way manifold at the front end of the engine. The water space in the top cylinder is formed by a separate detachable cast iron jacket, which leaves a space of $2\frac{1}{2}$ in. from the top of the water jacket to the top of the cylinders. This cast dome jacket, running the full length of the block, is held down by four studs, which are drilled and used as priming cup inlets to the cylinders. The water does not completely surround the cylinders because each two of the cylinders are cast together, the water jacket running half the length of the cylinder.

Cylinders are flat combustion chambers and chambered at the bottom, held down with 10 stud bolts, five on each side; the valve guides are cast integral with the cylinders and are 3 in. long. The cylinder walls are $\frac{3}{8}$ in. thick. The casting is a detachable cast iron plate so that the valves are fully enclosed from dust. This block is a good piece of foundry work.

Flywheel is of cast iron, semi-finished all over, 19 in. in dia., width $5\frac{1}{2}$ in., rim $2\frac{1}{2}$ in., counterbored 4 in. for cone clutch. Flywheel is two piece to permit the use of an inverted cone clutch.

Crankcase, Crankshaft and Bearings

The upper half of the crankcase is of cast iron with no special features in construction, the walls being approximately $\frac{5}{16}$ in. thick. The lower half of the crankcase is of pressed steel, which composes the oil sump and contains four pressed steel individual oil troughs for the connecting rod scuppers. These troughs are held into the case by four $\frac{3}{16}$ in. fillister head screws. The lower half of the crankcase carries a $\frac{1}{8}$ in. fiber gasket, which is riveted onto the case. The lower half of the case is held to the upper half by thirty-five $\frac{1}{4}$ in. studs.

Crankshaft is a built-up shaft, comprising three drop forgings and two cast steel parts. The front forging carries the timing gear, front crankshaft bearing and one rod

bearing. This is connected to the circular steel casting with tapers, two $\frac{3}{8}$ in. x 1 in. dowels and nut. The second or center forging carries the center crankshaft bearing and two rod bearings, one on each end, this being fastened at each end to the circular casting with taper, two $\frac{3}{8}$ in. x 1 in. dowels, and nut. The third forging carries one connecting rod bearing, two crankshaft bearings and the flywheel hub, the hub being a separate steel forging held on by nut and straight key. This is fastened to the circular cast steel part with taper, two $\frac{3}{8}$ in. x 1 in., two dowels and nut.

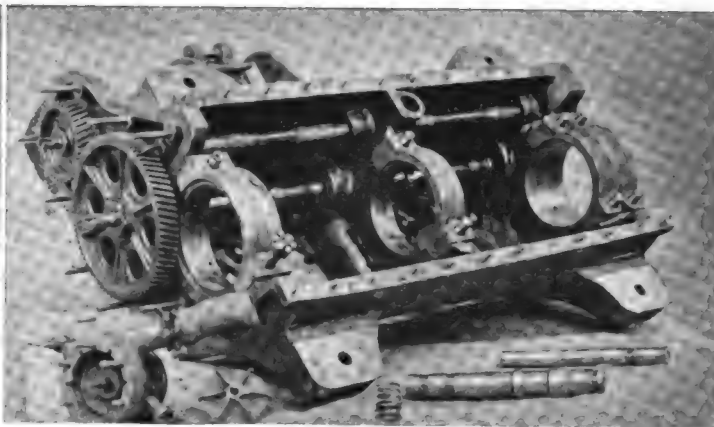
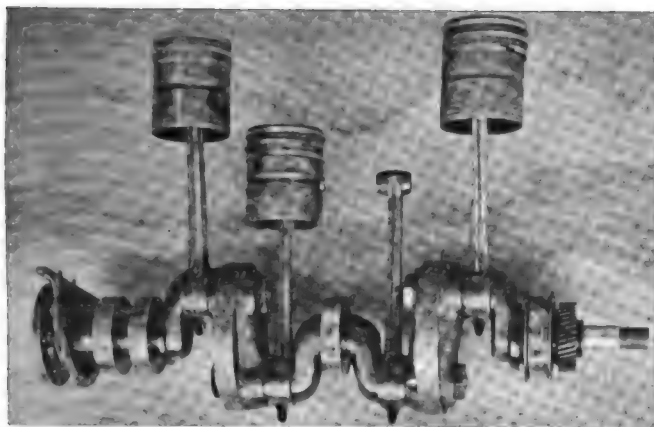
The assembly is drawn together by the nuts. After alignment and balancing, the nuts are removed and the dowel holes are drilled in half the forging and casting. The dowel is inserted and the nut replaced. Crankshaft has four plain roller bearings: front, center and two rear with two ball thrusts. The four roller bearings are of the same size, having fifteen $19/32$ x $\frac{5}{8}$ rollers hardened and ground, with $\frac{1}{8}$ in. x $\frac{1}{8}$ in. recess shoulders on each end, which extends through a $\frac{1}{8}$ in. x $\frac{1}{2}$ in. hardened and ground steel ring. The inner and outer race also has $\frac{1}{8}$ in. counterbore. To assemble the bearing the inner and outer are separated by inserting the rollers. The rollers are separated by adding on each side the steel discs. The discs are held by three $\frac{3}{16}$ in. screws, making a self-contained bearing with all edges flushed. The front and two rear bearings have races which are held in place by a straight key. The center bearing has no race, as the rollers are run on the shaft, which is hardened and ground. By taking out the three screws the discs on each side can be removed, allowing the rollers to be pulled out. The outer race then will slide around the throws of the shaft. Crankshaft bearings are held in the upper half of case by two $\frac{1}{2}$ in. studs and steel caps.

Connecting Rods and Bearings

Connecting rods are I-beam, drop forgings, semi-finished, with caps and oil scuppers forged integral with the rod, the scuppers being extra large. Running the full length of the rod on each edge are oil collection channels, which collect the oil and by-pass it through $\frac{1}{4}$ in. holes to the connecting rod bearings.

Connecting rod bearings are of the plain roller type, composed of sixteen $\frac{5}{16}$ in. x $1\frac{1}{8}$ in. rollers hardened and ground. The rollers are held in a soft steel retainer, machined out of solid stock. Pressed into the connecting rod is the outer roller race, which is $\frac{1}{8}$ in. less in length than the width of the rod. This forms a recess so when the retainer is inserted the outer edges of the bearing are flush with the rod. No inner race is used, as the rollers

*Mr. Hays is chief of the experimental section, Motor Transport Corps.



Crankcase, water pump and oil pump



Above—Crankshaft, connecting rods and pistons assembled. Below—Disassembled connecting rods, crankshaft front and center halves and counter-balance

are in contact with the crankshaft, which is hardened and ground at the roller contact only. Piston pin bearings are hardened and ground steel bushings and press into the connecting rod.

Pistons and Pins

Flat head type with a cross system of webbing on the inside. The head of the piston has a $\frac{1}{8}$ -in. x $\frac{1}{8}$ -in. V-shaped groove running around the outer edge of the head. The piston has three $\frac{1}{4}$ in. concentric hammered lap joint compression rings, these rings being $\frac{4}{32}$ in. in diameter when loose by $\frac{1}{8}$ in. thick. The top ring sets within $\frac{3}{16}$ in. of the top of the piston with a space of $\frac{7}{16}$ in. between the other two rings. In the center of this space there is a $\frac{1}{32}$ in. x $\frac{1}{32}$ in. oil groove. There are three $\frac{1}{32}$ in. x $\frac{1}{32}$ in. oil grooves in the skirt, with four of the same size grooves, forming a V, leading from the bottom groove on the skirt up to the piston pins. The piston is milled off around the area to allow for the expansion of the piston pin bosses. There are two $\frac{3}{16}$ in. holes on each side of piston pin and at each end, for passing the oil down to a groove on the piston pin, where it flows and lubricates the piston pin bushing. The piston pin is $\frac{7}{8}$ in. in diameter and $3\frac{1}{8}$ in. from top of piston, the pin being held in place by set screw and cotter key. There is a large crescent-shaped groove $\frac{1}{2}$ in. wide x $\frac{3}{64}$ in. deep running around at the location of the piston pin. The piston is $5\frac{1}{2}$ in. long, and on the inside of this skirt there is a $\frac{1}{8}$ in. rib running around the lower end, the skirt being $\frac{3}{32}$ in. thick. The piston pin is constructed out of steel tubing hardened and ground. All pistons are ground.

Timing Gears

Spiral type with soft forged steel gears on the crankshaft and magneto drive. The camshaft gear is a spider cast-iron gear. Timing gear on the end of the crankshaft is 4 in. outside diameter, having 39 teeth with 1 in. face, $\frac{7}{64}$ in. deep and $\frac{5}{64}$ width at base of tooth. The magneto driving gear is of the same type and construction. The camshaft gear is held on by straight key and nut on to the camshaft.

The camshaft is a forging with the cam forged integral, $1\frac{5}{16}$ in. in diameter, supported at each end with annular type ball bearings, the center supported by plain, split bronze bushing. The true radius of the cams is $1\frac{7}{16}$ in., the face of the cams being $\frac{5}{8}$ in. with $\frac{5}{16}$ in. lift. This shaft is ground finished all over, hardened only on the cams.

Valves

Mushroom type, $1\frac{3}{4}$ in. in diameter, $\frac{1}{8}$ in. wide, 30 deg. seat. These valves are two-piece construction with the lower end hard. Valves $8\frac{1}{4}$ in. long with a $\frac{3}{8}$ in. diameter stem. The springs are the straight type spring held with a machined cap, the cap being held with a $\frac{1}{8}$ in. x $\frac{1}{2}$ in. straight key going through a broached hole on the valve stem. The valve cap plugs are malleable cast iron, tapped for metric plugs.

Governor

Fly ball type, located into the fan belt driving pulley on the end of the crankshaft. The motion is taken away from the governor by a fork bell crank roller arm, working in a sliding sleeve, which is of bronze and slides back and forth on the pulley hub. Fan pulley is fastened on the crankshaft by a straight key through the hub, held on by the starting crank clutch, which is screwed into the end of the crankshaft.

Oiling System

The oiling system is a plunger pump, driven by an auxiliary cam on the camshaft, running down into the lower half of the crankcase. The plunger is a $\frac{13}{16}$ in. diameter steel tubing 8 in. long, one end plugged to form the $\frac{3}{8}$ in. ball check seat. This is the suction end. The other end is plugged with a crown cap, which comes in contact with the cam. The barrel of this pump is of cast iron construction, there being a spring working between the crown head plunger and end of the pump barrel to keep the plunger following the cam; this is compressed with the cam and forces the oil out through by-passes in the plunger and the plunger barrel. From there the oil is forced into a $\frac{3}{4}$ -in. steel tubing conduit, running the length of the crankcase, having four $\frac{1}{8}$ -in. holes drilled to where the oil flows into the troughs in the lower half of the crankcase, where it is picked up by the scuppers on the cap of the connecting rod. One end of the oil conduit leads to the timing gear case and is plugged to discharge a $\frac{1}{8}$ in. stream of oil onto the timing gears. The balance of the lubrication of the motor is by splash system, there being a channel on each side of the connecting rod, leading from the large end up to the wristpin bushing. At the

base of the large end of the rod are drilled two holes by-passing the oil to the connecting rod bearings.

Water System

Three-in. six blade bronze cast impeller pump. Water entrance to the pump is through the center, having a $\frac{7}{8}$ in. discharge and a $\frac{7}{8}$ in. intake. The width of the pump impeller blades is $\frac{1}{2}$ in. This pump is located on the front end of the timing gear case and is driven by a coupling from the magneto drive shaft.

Ignition

Ignition system is a single system high tension type F. E. 4 D. Mea magneto. The magneto is clockwise and the advance is by advancing the magnetic field in opposite direction of rotation of the armature. Magneto is placed on the right hand side of the engine and is driven by a cross shaft, which is driven by a spiral gear off of the camshaft in rear of the camshaft timing gear. The high tension wires are enclosed in a fiber tube, which is bolted onto the side of the cylinders. For checking up the position of the secondary distributor rotor, there is placed in the secondary distributor cover a celluloid window opposite contact for number one cylinder.

Carburetor is a vertical Pallas, type IV, $1\frac{5}{8}$ in., with a 28 mm. venturi throat. The float is of cork and is shellacked. The carburetor is of cast bronze with an aluminum bowl, having a hot-air attachment. The idle adjustment is by a stationary well. The high speed is through a well running

angular through the venturi, fuel being restricted by a compensator. The throttle valve is a butterfly type.

Fan

Twenty and one-half in. in diameter. Five blades with rim. Material, sheet steel riveted to sheet steel hub with a sheet steel fan pulley. The fan shaft is mounted on a ball bearing with no adjustment. The fan bracket consists of a cast iron bracket with clamped end holding a vertical shaft. The vertical shaft has an adjustment on the bottom, consisting of an adjusting screw and check nut, which raises the shaft up or down in the bracket.

Weights

Connecting rod and piston complete, 9 lb. 12 oz.

Valve, 9 oz.

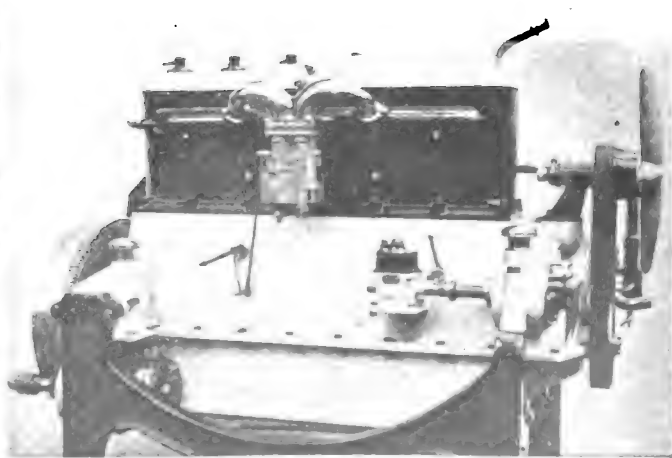
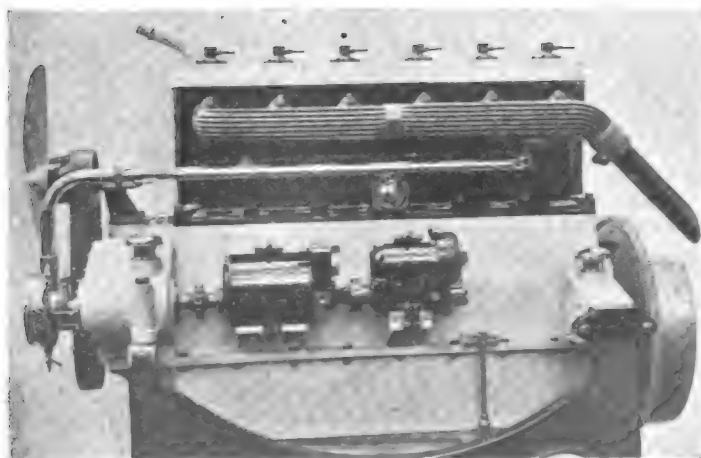
Valve spring, 4 oz.

The workmanship upon this engine is high grade, notably the cylinder block casting. The pistons show good workmanship, valve springs being nickel plated and individual fittings on all parts; the built-up crankshaft is of first-class construction. This engine is very compact and simple and has no excess weight of parts. It would make a good service job, excepting for the built-up crankshaft, there being no adjustment to either the rods or crankshaft bearings. Replacement of the rollers by a good mechanic could be easily accomplished. In general, the engine follows American practice.

New Minerva-Knight Engine Design

AN entirely new design of Knight engine, a six-cylinder 90 x 140 mm., has been completed by the Minerva Works of Antwerp, Belgium, and will be in production in March. It is a very clean-looking design, with integral intake manifold and separate exhaust manifold. On the exhaust side, the water pump, electric generator and magneto are in line, the water pump being ahead of the timing gear housing and the two other parts to the rear of it. On the opposite side the oil pump is ahead of the timing gear housing and Kellogg tire pump to the rear. The electric starting motor is on the same side but under the rear crankcase hanger, its pinion engaging with an external gear on the flywheel. The two blade aluminum fan is belt-driven from the crankshaft and can be put into or thrown out of engagement by a jaw clutch.

The crankshaft is counterweighted and balanced and is carried in seven plain bearings. Connecting rods are tubular and pistons are aluminum. A duplex Zenith carburetor is fitted and is connected to the cast manifold by a water jacketed Y intake pipe. All the hot air for the carburetor is drawn from the crankcase and for this purpose four breathers are fitted, one on each hanger. In addition, there is, between the third and fourth cylinders, on the exhaust side, an air intake with an adjustable shutter, this supplying air to the carburetor through a gauze filter, when the crankcase air is too hot. To facilitate starting, gasoline can be sprayed from the dash into the cast intake manifold. It is stated that a four-cylinder engine of the same bore and stroke and the same general design will also be produced.



Minerva 6-cylinder Knight engine

The Growing Need for Accurate Testing Instruments

The increasing importance of having testing instruments in the up-to-date factory was emphasized at an exhibit by the American Society of Mechanical Inspectors. Some of the inspection methods are outlined here.

MANY forms of inspection equipment for the modern factory were exhibited recently at the Hotel Astor, New York. The occasion was the first annual convention of the American Society of Mechanical Inspectors, an organization founded to extend the use of accurate measuring and testing instruments and to encourage the application of the best methods for the inspection of factory products.

The exhibitors included the following:—The United States Bureau of Standards; The American Society of Mechanical Inspectors; William Brewster, Inc.; Coats Machine Tool Co., Inc.; The College of the City of New York; Greenfield Tap and Die Corporation; Holz & Co., Inc.; Inspection Engineering Equipment Co.; C. E. Johansson, Inc.; Arthur Knapp Engineering Corp.; New York Testing Laboratories; Shore Instrument & Manufacturing Co.; Pratt & Whitney Co.; The Inspector Publisher Co.; The Industrial Press Publishing Co.; Wilton Tool & Mfg. Co.; West & Dodge Mfg. Co., and Jones & Lamson Machine Co.

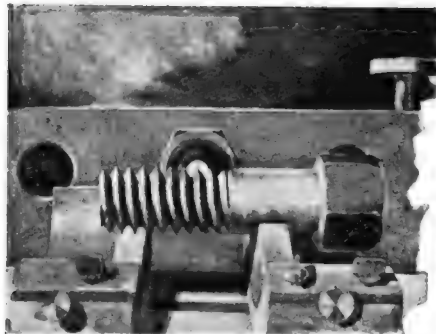
The optical method of testing bolt threads by throwing them upon a screen attracted much attention. For this test, a Hartness screw thread comparator was used, comprising a suitable lantern, a work holder, and the necessary lenses, all mounted on a substantial column. A short distance in front of the lantern was a tolerance chart on which was projected the thread shadow. Complete darkness is not necessary, or desirable, for such purposes, and a moderately lighted room was used. This display was made by the Jones & Lamson Machine Co., who em-

ploy the method in their machine shop and also manufacture the apparatus.

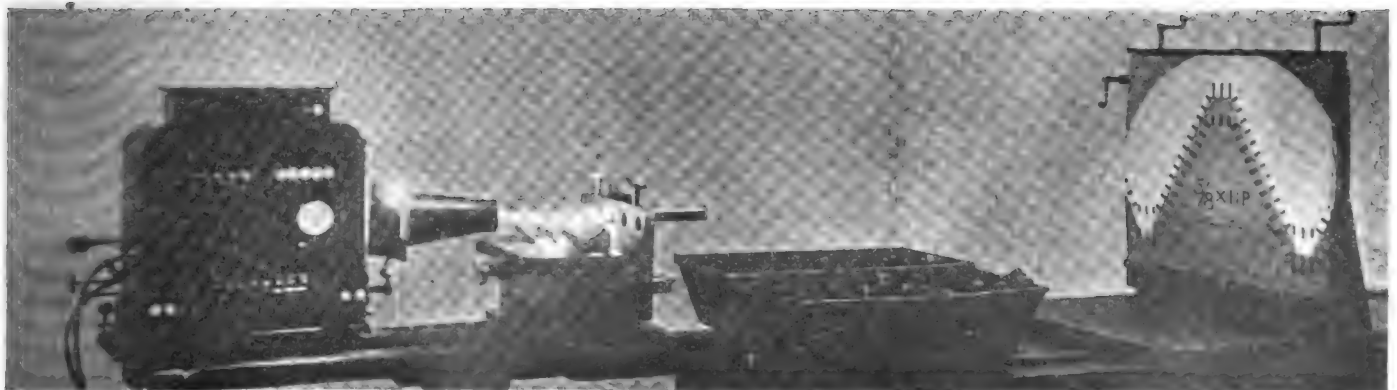
In tests of this nature an image of a plug or bolt with a standard thread is first thrown upon the screen and brought into position on the tolerance chart that is a large profile of the thread with the limiting values dotted in to scale. A useful size of chart is one about 200 times that of the bolt, if a small one, and the image is adjusted accordingly. When the standard plug has been removed, the bolt to be tested is inserted in the same position and the shadow examined to see if it falls within the tolerances. This examination requires but a glance, as a rule, to learn the entire story of the workshop.

To hold the master plug or the tested bolt in position, a nest of a few threads is used, and is placed a little to one side of the position occupied by the thread thrown upon the screen. The position of this nest is chosen arbitrarily, but the distance off center is usually about the thickness of the nut. If the lead of the tested bolt is not correct, the shadow will appear outside of the tolerances on the chart. Both the lead and the dimensions of the thread are thus readily determined by the enlarged image.

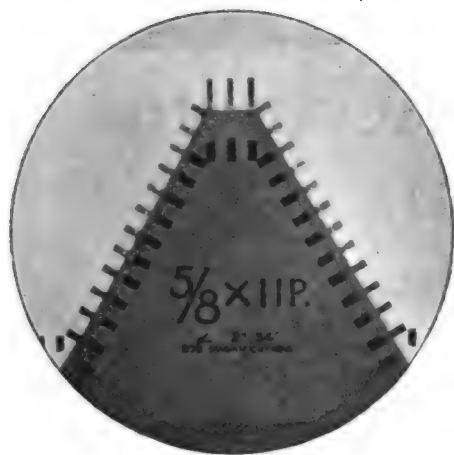
One of the manufacturers present stated that he uses the method in testing the run of bolts turned out in his shop, several tests being made during the day. This gives a true indication of what the machines are doing and prevents the scrapping of large numbers of bolts. If a machine is not running true, the error is detected before extensive waste occurs.



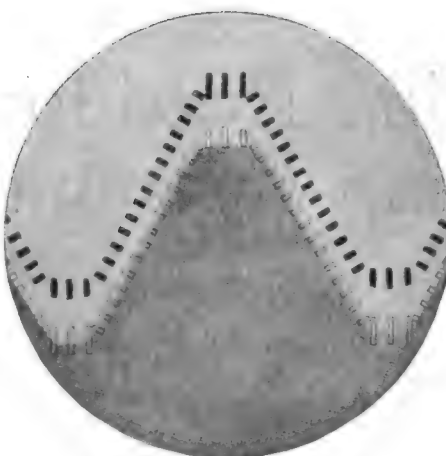
*Lenses project first standard,
then bolt threads*



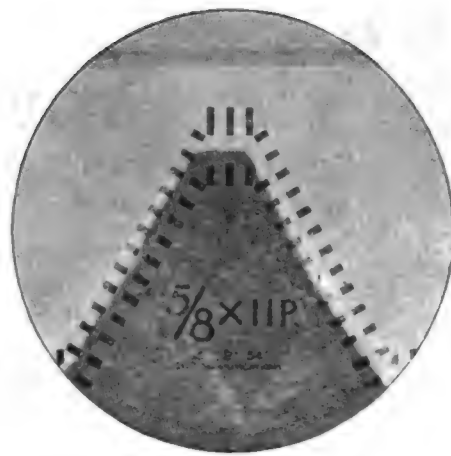
The Hartness screw thread comparator in use



Standard plug gage shadow on tolerance chart



Undersized bolt thread shadow falling outside tolerances



Thread shadow falling to left shows error in lead

Various other methods were demonstrated for thread testing and verification of gages. Manufacturers present agreed that some accurate system of bolt testing should be in use, not only in bolt factories, but also in other machine shops where accurate and durable work was important. Checking up dies as well as bolts was regarded as necessary, also when reliable nuts and bolts were an important factor. Thread lead testers were exhibited by West & Dodge, together with other special gage equipments. The complete line of Pratt & Whitney thread gages were shown, in addition to snap gages, cylindrical and tapered gages. Mechanical inspection apparatus and laboratory equipment were shown by the Inspection Engineering Co. of New York. Representatives of the Arthur Knapp Engineering Corp., which manufactured considerable inspection equipment for the U. S. Bureau of Standards, strongly voiced the general sentiment for increased inspection.

Emphasizing the necessity of properly marking gages and tools, the Wm. Brewster Co., Inc., featured their improved Etchograph. The tool or other metal object to be marked is laid on one terminal of the electrical apparatus used for the purpose, while the other terminal is manipulated in much the same way as a pen or a pencil to do the marking. The machine can be readily connected to any 110-volt or 220-volt, 60-cycle, single-phase circuit, while special machines are arranged for connection to other circuits. As the power is utilized only while etching, comparatively little current is required. The only wearing part is the point or pencil, and it may be replaced with ordinary copper wire.

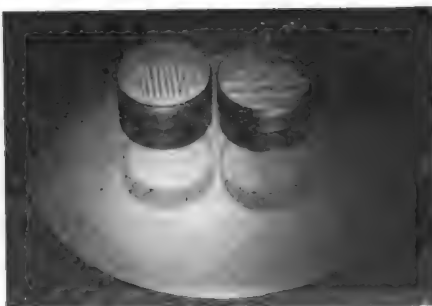
How broad the field of inspection is becoming and what remarkable progress is being made in methods and apparatus, would not occur to the average person who has not seen assembled in one place the varied assortment of instruments used for the purpose. There is room here for detailed descriptions of only the most striking of the instruments of the newer types, with a mere reference to some of the improvements in the older forms. So important is the field becoming that the prediction is made that colleges in future will confer the degree of Inspector Engineer.

Other apparatus which attracted attention, besides that already mentioned, included convenient types of sine bars for measuring angles direct, practically without calcula-

tion. Complete gaging products were demonstrated by the Greenfield Tap & Die Corp., and comprised spline gages, thread and limit gages and special fixtures. The exhibit of the Coats Machine Tool Co. included the improved Prestometer and the latest accessories. The pyroscope, featured by the Shore Instrument & Mfg. Co., attracted attention, as did also the scleroscope and methods for testing the hardness of metals. Portable Brinell meters and the standard Brinell machine were exhibited by Holz & Co. C. E. Johansson, Inc., exhibited gage blocks and measuring implements. The guiding hand of the U. S. Bureau of Standards was evident throughout the exhibition and the experts from that department did much in making clear the finer points of inspection problems. In a booth maintained by the American Society of Mechanical Inspectors, historical objects, statistics and inspection implements of various kinds were brought to the attention of those interested.

The method of making minute measurements by means of light interference was demonstrated by the Wilton Tool & Mfg. Co. and the Pratt & Whitney Co., in connection with their display of gage blocks, and by the Bureau of Standards. The importance of the method, it was pointed out, lies not so much in the actual value of using the millionth part of an inch in the shop as in the provision of a delicate method of testing the flatness of surfaces and even of comparing the lengths of gages.

In the demonstration, a red light and flat glass disks were used, the latter being ground to a degree of accuracy represented by $\frac{1}{4}$ to $\frac{1}{2}$ of a wave length of light, or between 0.00001 and 0.000005 of an inch. In making the test for flatness, the glass is simply placed on the surface under examination, care being taken to insure good contact. Then the light bands are studied, the straight bands indicating a flat surface and the crooked bands an uneven surface. That is all the operator needs to know in making the test. The



The straight interference bands indicate a flat surface in the light wave method of gage testing

mathematical theory of light need not be gone into, as that has been worked out previously. In practice, the method is simplicity itself. The demonstrators stated that, in their laboratories, young girls were applying the tests and developing great skill, "who wouldn't know wave lengths of light from a flock of robins."

By applying a slight pressure on one side of the disk, the distance apart of the bands may be varied. Points



A set of Wilton master gage blocks

90 deg. apart should be pressed in this manner, by turns, to make the tests more thorough. This guards against the possibility of mistaking a cylindrical surface for a flat one, for the cylinder also shows straight bands if the glass

rests evenly upon it. The pressure also insures the existence of a wedge of air between the two surfaces, a condition necessary to the formation of the interference bands. If the two surfaces in contact could be perfectly flat and parallel, the bands would entirely disappear.

To compare the lengths of two measuring blocks which are approximately alike, simply lay them beside each other with the flat disk over them. The block that has the fewer interference bands is the longer, for the pitch of the wedge is less. Moreover, using the red light as explained, the difference in the number of bands is the amount in hundred-thousandths of an inch. If there is about half a band's difference, then the difference in length is about half of a hundred-thousandth, or five-millionths of an inch.

In the case of curved bands, denoting a curved surface, the amount of curvature can be estimated with great accuracy. When the glass is placed flat upon the surface, the number of curved bands is counted from the central spot to the edge, this being the number of hundred-thousandths of an inch by which the flatness of the surface is in error.

Redesigned Garvin 12-Inch Cam Cutting Machine

THE feature distinguishing this machine from previous designs is that the spindle is now horizontal instead of vertical, and this change has been accompanied by certain other desirable modifications as hereafter described.

The machine is designed for cutting either flat or cylindrical cams. For cutting flat cams the work is mounted on the end of the work arbor, toward the spindle, with a former at the outer end of the arbor. A worm gear drives the work arbor from a universal power feed shaft. Power is transmitted through spur gearing, giving three changes of feed for the flat cam cutting fixture only.

The arm containing the work arbor pivots on the forward end, and is held at the rear end in guides, all mounted on the same table. To keep the former-pin against the former, offsetting the pressure of the cutter, the arm is provided with a number of detachable weights. These weights can be added to either end of the arm, and are made so as to release the pressure when cutting steep angled cams.

The illustration herewith shows the machine arranged for cutting cylindrical cams. In changing from the flat cam fixture to the cylindrical fixture, a slide bolted to the saddle of the machine is taken off and laid aside. The power feed universal joint shaft readily detaches for this purpose and attaches to the cylindrical fixture.

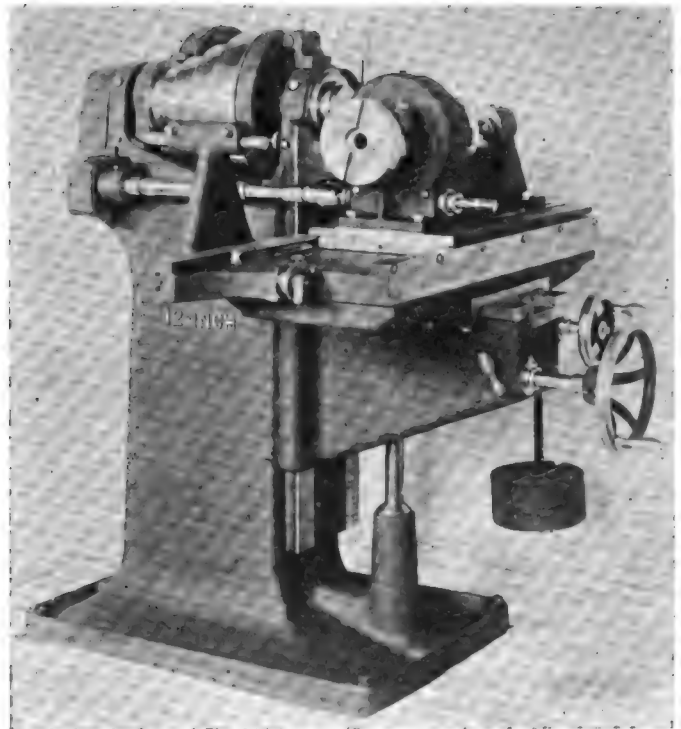
In operation, the feed rotates the work on the work arbor, the work being mounted on the far side of the fixture and the former on the other end of the work arbor.

The former-pin, shown in the front of the machine, is kept against the former by weights.

The movement of the cylindrical fixture is said to be very sensitive, as it works on large balls in a V shaped, tool steel track. The feed of both attachments can be disconnected by clutch, giving hand feed control by wrench. This is said to be very handy in setting up for cams that are cored, as well as for helping over steep angles.

The worm shaft is provided with a square end to receive the crank. The spindle of the machine is of Garvin standard milling machine construction. All gearing is

housed. There are two changes of feed provided on the machine when using the fixture for cutting cylindrical cams.



Garvin cam cutting machine

THE City of Canton, China, has a motor population of fourteen passenger cars and ten motorcycles, according to reports in *The Oriental Motor* of Shanghai. A new forty-mile highway in the Hounghshan district, serviceable for motor traffic, will be opened within a few months, the journal adds.

Energy Distribution Chart for Coils

Mr. Geist simplifies equations shown in a previous article. He presents a chart which offers a simple method of analyzing the energy performance of coils regardless of the proportion of their characteristics.

By Harry F. Geist, E.E.

IN an article entitled Energization of the Ignition Coil, published in AUTOMOTIVE INDUSTRIES, Vol. XLI, page 824, the writer presented three equations (10), (11) and (12) for theoretically determining the amount of energy expended by the supply source, the amount of energy loss due to resistance of the circuit and the amount of energy stored in the coil respectively for any period of closed circuit.

These three equations are as follows:

$$W = \frac{E^2 t}{R} \left[1 - e^{-\left(\frac{Rt}{L}\right)} \right] + \frac{E^2 L}{R^2} \left[1 - e^{-\left(\frac{Rt}{L}\right)} \right] \quad (1)$$

$$W_r = \frac{E^2 t}{R} \left[1 - e^{-\left(\frac{Rt}{L}\right)} \right] + \frac{2E^2 L}{R^2} \left[1 - e^{-\left(\frac{Rt}{L}\right)} \right] + \frac{E^2 L}{2R^2} \left[1 - e^{-\left(\frac{2Rt}{L}\right)} \right] \quad (2)$$

$$W_s = \frac{E^2 L}{2R^2} \left(1 - 2e^{-\left(\frac{Rt}{L}\right)} + e^{-\left(\frac{2Rt}{L}\right)} \right) \quad (3)$$

It is evident at a glance that these equations are very cumbersome and therefore very unsatisfactory to make calculations from. A simpler method would be much more desirable.

To attain this purpose, the writer has developed a chart, shown in Fig. 1 herewith, which not only simplifies the calculations for any particular case, but is applicable to any coil, regardless of the proportions of its characteristics, provided it comes within the assumption of a constant voltage, constant resistance and constant inductance values.

This chart is arrived at in the following manner.

It was pointed out in the article referred to that time can be expressed in terms of inductance and resistance, as for example

$$t = \frac{L}{R}, \frac{2L}{R}, \frac{3L}{R}, \text{ etc.}$$

From this fact it is found that by substituting various values of time in the above equations (1), (2) and (3), they all take the same general form

$$W = K \frac{E^2 L}{R^2} \quad (4)$$

in which the value of the constant K depends upon the expression for time used and the particular equation from which it is derived. This common expression for all three equations suggests a simple chart.

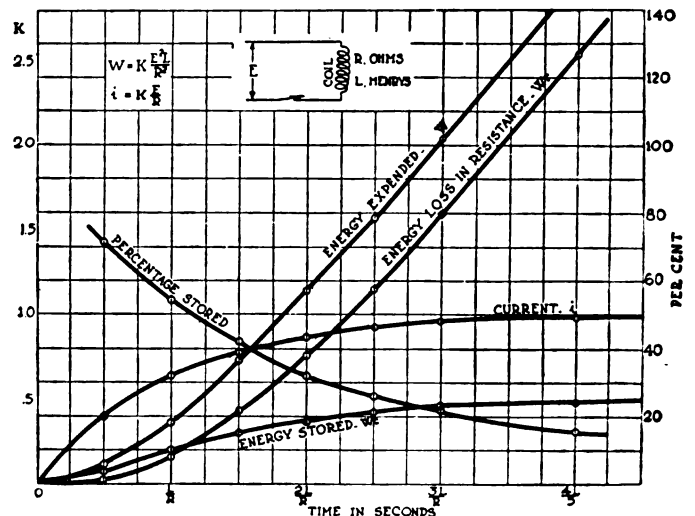


Fig. 1—Energy distribution chart for coils of constant E , L and R

The values

$$t = \frac{0.5L}{R}, \frac{L}{R}, \frac{1.5L}{R}, \frac{2L}{R}, \frac{2.5L}{R}, \frac{3L}{R}$$

and $\frac{4L}{R}$ were substituted in each of the equations and the resulting values of K in each case was plotted against time in its inductance and resistance proportionality form, giving the three curves shown in the chart. The "energy expended" curve was derived from equation (1), the "energy loss in resistance" curve was derived from equation (2) and the "energy stored" curve from equation (3).

Along with these curves a fourth curve shows the percentage of the energy stored for the different periods.

It is comparatively a simple matter to determine from this chart the amount of energy expended in a coil for any given period of time following the closing of the circuit, as well as the manner in which it is distributed.

EXAMPLE

As an example, assume an ignition coil whose primary has a co-efficient of self-induction of 0.012 henrys. Assume that the coil is to operate on a 6-volt battery and that the combined coil and battery resistance is found to be 2.0 ohms, and also that the timer mechanism is designed to hold the circuit closed at normal engine speed for 0.015 second. Determine the amount of energy expended by the battery.

First, it is necessary to reduce 0.015 second to terms of inductance and resistance. This is done as follows:

$$t = \frac{XL}{R} \quad (5)$$

from which by substituting the values of t , L , and R ,

$$X = \frac{0.015 \times 2}{0.012} = 2.5$$

and therefore

$$t = 2.5 \frac{L}{R}$$

represents the equivalent of 0.015 second in terms of the inductance and resistance factors.

Referring to the chart, it will be found that the value of K on the "energy expended" curve corresponding to $t = 2.5 L/R$ is about 1.58. Now by substituting the values $K = 1.58$, $E = 6$, $L = 0.012$, and $R = 2$, in equation (4), the energy expended is found to be

$$W = \frac{1.58 \times (6)^2 \times 0.012}{(2)^2} = 1.58 \times 0.108 = 0.171 \text{ joule}$$

giving the amount of energy expended for the period 0.015 second.

The percentage curve shows that 26.5 per cent of this amount is stored in the circuit available for the spark, or

$$W_c = 0.0454 \text{ joule,}$$

leaving the balance

$$W_r = 0.1256 \text{ joule}$$

representing the loss due to the resistance. The values W_c and W_r can also be determined from the value of K and equation (4) in the same manner that W was found.

It is evident from the above example that this chart offers a very simple method of analyzing the energy performance of coils.

In coils having an iron core, the inductance undergoes some change with the increased density of magnetization, so that the chart does not hold strictly true, but will agree as closely with the actual phenomena as the results shown in Fig. 3 of the article referred to. For coils without iron cores the actual and theoretical phenomena will be practically the same.

Spark Plug Tests for Motor Transport Corps

SPECIFICATIONS of tests that must be undergone by spark plugs to be sold the Motor Transport Corps of the American Army have recently been approved and adopted as standard, and any commercial plug purchased for army use must meet the requirements to be placed upon the approved list. The specifications follow:

I. GENERAL

(a) This specification covers the type of spark plugs used in engines of motor trucks and passenger cars.

(b) Plugs shall preferably be two-piece construction. Plugs with other than conventional shaped spark point terminals must be submitted to the Motor Transport Corps for approval of each type.

(c) To be approved for purchase a type of spark plug must conform to the specifications and tests described below; and must also have been found to give satisfactory service for at least 100 hours total running time on road or dynamometer test, at the discretion of the Motor Transport Corps and on an engine of a type to be specified by the Motor Transport Corps. The running test shall include (1) idling, (2) light load, (3) average load, (4) full load.

(d) Test of spark plugs shall be conducted at the option of the Motor Transport Corps.

(e) The laboratory tests shall be made either at the Bureau of Standards, Washington, D. C., or by any other recognized authority to be designated by the Motor Transport Corps.

(f) The tests described below shall be made on each new type of spark plug submitted for approval, and also on plugs of approved types at such other times as may be desired by the Motor Transport Corps, in order to insure the maintenance of the quality of the plugs delivered. In either case, ten (10) plugs shall be submitted for engine tests, and ten (10) plugs and ten (10) insulators without shells or electrodes for laboratory tests.

(g) In cases where the plugs contain types of insulator which have been already approved, the tests on the bare insulator may be waived at the discretion of the Motor Transport Corps.

II. CONSTRUCTION AND DIMENSIONS

(a) The threaded portion of the plug shall conform to the S. A. E. standard dimensions for $\frac{7}{8}$ -in. and metric spark plug threads, and of the A. S. M. E. for $\frac{1}{2}$ -in pipe thread, to within their respective tolerances.

(b) The gap between the electrodes shall be between

0.5 mm. and 0.7 mm. (0.020 in. and 0.028 in.) and the design and construction shall be such as, in the judgment of the inspector, to maintain this spacing under all conditions of use.

(c) Terminals with 8-32 threads shall be of the screw and nut construction, and the nut shall be adapted to take either eyelet or split spade terminal.

III. TESTS

(a) Dielectric Strength. Three of the sample insulators shall withstand for two minutes without puncture an effective alternating voltage of 25,000 volts applied between the central electrode and a metal band around the outside of the insulator. This test is to be made while the insulator is immersed in oil at room temperature. The passage of a spark over the surface of the insulator shall not be counted a failure unless it occurs at less than 20,000 volts.

(b) Resistance to Mechanical Vibration. Two of the assembled plugs shall be tested in the manner described below and shall show no cracks or other signs of mechanical damage after 25,000 blows. The plugs are screwed firmly into the side of a steel block 6 x 6 x 9 cm. (2.36 in. x 2.36 in. x 3.54 in.) which is carried on the end of an arm 24 cm. (9.44 in.) long. By means of a pair of cams the block is raised 19 mm. (.74 in.) and allowed to fall upon a hardened steel rail. A pair of tension springs assist in pulling the block downward and give it a velocity of about 200 cm. (78.74 in.) per sec. at the instant of impact.

(c) Resistance to Thermal Cracking. Five insulators with shell and central electric removed shall be brought to a uniform temperature of 150 deg. Cent. and then quenched in water at room temperature and examined for cracks by soaking for several hours in an alcoholic solution of eosin.

After the aforesaid quenching and soaking no cracks shall be visible to the naked eye. This test shall not apply to mica plugs.

(d) Gas Tightness. Six of the completed plugs shall be screwed into a pressure bomb containing air at a pressure of 15 kg. per sq. cm. (225 lb. per sq. in.) and immersed in a bath of oil heated to 150 deg. Cent. Under these conditions the average volume of air leaking through the plugs shall not exceed 1 cc. (.06 cu. in.) per sec., and that through the worst plug shall not exceed 2 cc. (.12 cu. in.) per sec. This test shall be made both before and after the engine test.

The Design of Pneumatic Tired Trucks

PART II

Continuing the article begun last week, Mr. McCreery sets forth his ideas on the construction necessary for heavy trucks equipped with pneumatics. He gives here some interesting results obtained from experiments in constructing a truck with six wheels. This instalment ends the series.

By C. M. McCreery*

THERE are now in satisfactory service wood wheels, 8 or 10 designs of cast-steel wheels and disk wheels. On all of these can be mounted either the so-called demountable type of rim or the so-called detachable rim. (See Figs. 2 and 3.)

The arguments for the demountable rim are the inflated spare tire and the short time required for a tire change. Against the demountable are the extra weight required, the extra cost and the possibility of mechanical troubles. The detachable rim arguments are the exact opposite. In its favor are less weight and cost and a greater freedom from mechanical troubles. Against it are the arguments of time required for a tire change and means of inflating the tire after it is changed.

Tubes for pneumatic truck tires must be designed and compounded so as to retain as much of their original strength and shape as possible, after being subjected in service to more or less heat and to continued flexing.

Flaps assume considerable importance in tires inflated to the recommended pressures. It is important that the flap fit well, so that there will be no adjustment when the tire is inflated, causing a localized stretch in the tube at the edge of the flap.

The valve question had to be approached from two angles; first, from the standpoint of holding air at pressures from 90 to 140 lb. and second, from the standpoint of ease of tire change. The valve-insides on all tubes 6 in. and larger are of a heavy-duty type, different from the ordinary valve-insides in construction, but the two are interchangeable in any valve stem (See Fig. 5). On the 10 and 12-in. sizes, which are inflated to 130 and 140 lb. per sq. in. respectively, even the heavy-duty type is at present unsatisfactory when used alone, so a combination is used in the form of a heavy-duty valve-inside and a needle valve operated by a hand-screw.

*Highway Transportation Division, Development Department, Goodyear Tire & Rubber Co.

Paper read at the truck and tractor meeting of the Society of Automotive Engineers at Chicago, Jan. 28—condensed.

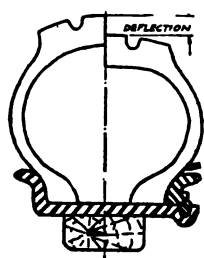


Fig. 1

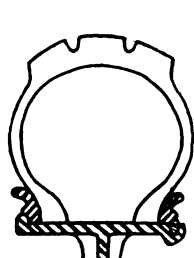


Fig. 2

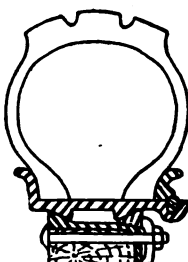


Fig. 3

Another important item is the arrangement of tires on the trucks. There are three possibilities: (a) the conventional truck with single pneumatic tires on four wheels, (b) dual pneumatics on the rear, and (c) trucks with six or more wheels.

The dual idea was tried and abandoned several years ago, but it crops up now and I want to set the reasons for dropping it clearly before you. The dual tires do not share the load equally, because the inflation is seldom kept

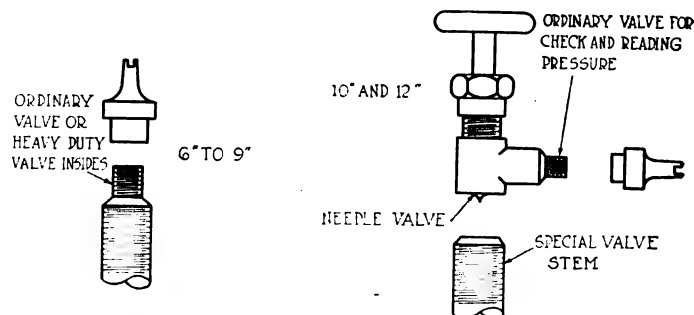


Fig. 5

alike in both tires and because on crowned roads, and more particularly rough roads, one tire takes more than its share of the load. Dual tires are too easily abused and prove more expensive than either of the other two possibilities.

The company came to realize some time ago that the introduction of the pneumatic tire for motor trucks would have a material bearing upon the design of the truck itself to get the most good from the use of such a tire. For this reason we have been making a study of the problem, and have at this time certain considerations to present.

Table VII shows road speeds that I consider satisfactory, together with the usual rear-tire specifications for various sizes of truck. The engine speeds are figured on the basis of 1200 ft. per min. piston speed, which value I believe can be considered a good average. However, some

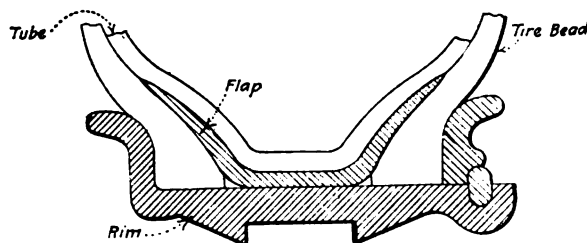


Fig. 4

TABLE VII

Present Solid Tire Gear Ratios	Solid Tire, Average Governed Speed, m.p.h.	Truck Capacity, tons	Recommended Speed for Pneumatic- Tired Truck, m.p.h.	Rear Tire Size, in.	Speeds		Pneumatic- Tired Truck Rear Axle Gear Reduction
					Rear Wheel, r.p.m.	Engine, r.p.m.	
7	17	1	30	36	280.0	1,450	5.18
8	17	1½	30	38	265.4	1,450	5.18
9	15	2	30	40	252.1	1,325	5.52
10	15	2½	30	42	240.1	1,325	5.26
11 to 12	13	3½	25	44	191.0		6.28
				38	221.1	1,200	5.43
12 to 13	11	5	25	48	175.0		6.86
				40	210.1	1,200	5.72
14 to 16	9	7	20	42	160.1		7.50
				44	152.8	1,200	7.85

* 6-wheel combination.

engines on the market may not operate successfully at this speed and again others can stand a higher speed. Higher speeds set up considerable vibration and add discomfort to driving. In general it may be noted that solid-tire gear-reductions range from 7 to 16, whereas recommended ratios for pneumatic tires range from about 5 to 8.

Table VIII shows a study in computed speeds over a given course which corresponds somewhat to the course

having 100 per cent more capacity than is the case with solid-tired trucks. This raises the question of how to apply such a capacity easily. In answer to this I would suggest the application of brakes to the front wheels when all the capacity possible is attained in the rear. Front-wheel brakes are now well developed, due to the use during the war of trailers which required brakes on the steering axles.

When the normal speed has been determined, we may next consider the tractive ability required to get over the road without the inconvenience of shifting gears too often. The tractive factors that I consider desirable and satisfactory are shown in Table IX, figured according to the formula at the head of the table.

The engine torque required to give these tractive factors is also shown, together with the sizes of engines on the market to-day that develop the torque required. There are conditions, however, where larger engines may be desirable. I believe smaller engines will not give satisfactory speed. The striking difference between tractive factors for pneumatic-equipped trucks and solid-tired trucks can be accounted for by the fact that the former, when approaching a hill, has about four times the momentum of the latter and will carry itself over a large percentage of hills without increased power. However, with the increased power applied it will ascend a very long, steep grade before requiring a shift in gears.

The figures here recommended are based upon numerous trials of trucks of various capacities in our transportation. With the high-gear tractive ability and engine size determined, we have next the low-gear ability to consider. We find a tendency toward a low-gear ratio in the transmission of 6 to 1 in 5-ton trucks. This, in connection with present solid-tire axle-ratios, gives a tractive factor of 0.42. A desirable low-gear ability for trucks equipped with pneumatic tires may be given as 0.50; it should not be less than 0.30.

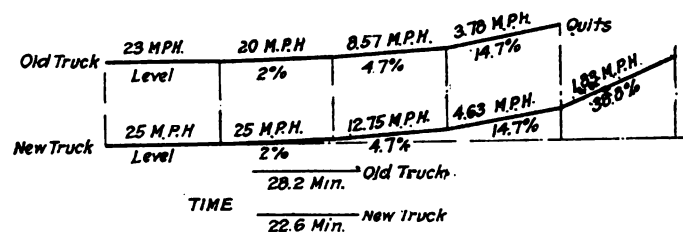


Fig. 6

from Akron to Cleveland, going by the way of Tallmadge in the one case, and by way of Akron's North Hill in the other. K-1 represents a "standard" make of truck in our transportation service. It will be noted that a normal speed of 25 m.p.h. is required to double the average speed of a solid-tired truck whose normal or governed speed is 11 m.p.h. The reason, of course, is that the solid-tired truck has a higher tractive ability in high gear, and hence is able to maintain its normal speed over a great many grades.

Fig. 6 shows how time can be conserved by a careful study of gear reductions. The saving on a course four miles long with grades as shown in the illustration amounts to 20 per cent.

On account of the higher speed of the pneumatic-equipped trucks, it is necessary to equip them with brakes

TABLE VIII

	Solid Tire, 1260 r.p.m.		New Job, 1400 r.p.m.		Six-Wheel, 1600 r.p.m.		K-1, 1400 r.p.m.	
	Speed, m.p.h.	Time, hr.	Speed, m.p.h.	Time, hr.	Speed, m.p.h.	Time, hr.	Speed, m.p.h.	Time, hr.
TALLMADGE								
3 miles, 6 per cent grade.....	6.66	0.45	8.57	0.35	6.25	0.48	8.15	0.37
3 miles, 3 per cent grade.....	11.00	0.27	17.90	0.16	10.50	0.29	14.10	0.21
34 miles, level	11.00	3.09	25.00	1.36	25.00	1.36	23.00	1.48
Total time		3.81		1.87		2.13		2.06
Average speed	10.50		21.40		18.70		19.40	
NORTH HILL								
1 mile, 12 per cent grade.....	3.52	0.28	4.63	0.22	3.47	0.29	3.78	0.26
2 miles, 6 per cent grade.....	6.66	0.30	8.57	0.23	6.25	0.32	8.15	0.25
3 miles, 3 per cent grade.....	11.00	0.27	17.90	0.16	10.50	0.29	14.10	0.22
34 miles, level	11.00	3.09	25.00	1.36	25.00	1.36	23.00	1.48
Total time		3.94		1.97		2.26		2.21
Average speed	10.10		20.30		17.70		18.10	

TABLE IX

Tractive Factor =
Maximum Engine Torque in pound-inches \times Efficiency of Transmission (0.90 in high gear, 0.85 in other)
 \div Gear Reduction \div Weight of truck and load in pounds $\times \frac{1}{2}$ the diameter of rear tire in inches

Truck Capacity tons	Pneumatic Tire Tractive Factor	Corresponding Solid Tire Tractive Factor	Engine Torque, lb.-in.	Engine Sizes on Market that Develop Approximate Torque Required, in.		
1	0.07	0.085	1,650	3½ x 5	4 x 5	3½ x 5½
1½	0.06	0.085	1,950	4 x 5½	4½ x 5¼	4½ x 5½
2	0.06	0.083	2,500	4½ x 6	4½ x 6¼	4½ x 5½
2½	0.06	0.082	3,000	4¾ x 6	4½ x 6¼	
3½	0.05	0.077	3,000	4¾ x 6	4½ x 6¼	
5	0.04	0.070	3,200	5 x 6	4¾ x 5½ (6 cyl.)	
7	0.04	0.060	3,300	5 x 6	4¾ x 5½ (6 cyl.)	

Table X shows the low-gear transmission ratios necessary to give these tractive factors. It will be observed that these ratios are considerably different from present practice. The question naturally arises, how can this best be handled?

A conventional design of transmission to give about 14 to 1 reduction in low gear is so bulky that it cannot well be considered. The next best and easiest arrangement is as shown in Fig. 7, where we have a three-speed unit transmission of regular design in combination with an auxiliary transmission having 3½ to 1 reduction

TABLE X—TRANSMISSION LOW-GEAR REDUCTION

Truck Capacity, tons	Low Gear Tractive Factor	Engine Torque, lb.-in.	Total Gear Reduction	Rear Axle Reduction	Transmission Reduction in Low Gear	Trans. Dedn. 0.30 Tractive Factor
1	0.50	1,650	49.1	5.18	9.47	5.68
1½	0.50	1,950	51.0	5.47	9.32	5.58
2	0.50	2,500	49.5	5.26	9.42	5.64
2½	0.50	3,000	51.7	5.52	9.37	5.62
3½	0.50	3,000	61.4	5.43	11.30	6.77
5	0.50	3,200	79.7	5.72	14.00	8.40
7	0.50	3,300	105.0	7.50	14.00	8.40

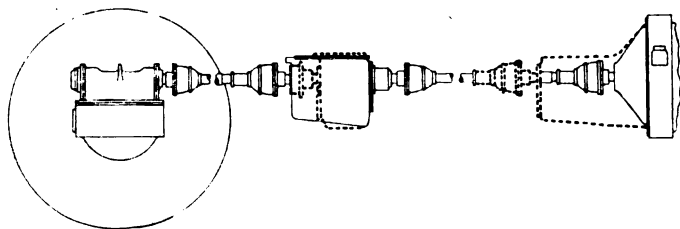


Fig. 7

which, combined with the 4 to 1 low-gear reduction in the unit set, gives 14 to 1 total transmission low-gear reduction. Dotted lines in the figure show the unit and auxiliary, whereas the light full lines represent the standard amidships construction. A compact gearset system involves the combination into one of the two sets above mentioned.

Any fixing of allowable stress requires an investigation of the cushioning effect of pneumatic, as compared with solid, tires.

Fig. 8 shows the rate of deflection of the pneumatic tires and their corresponding solid tires, together with a curve showing how the solid tire loses resilience with age and wear. It will be seen here that for a given load the pneumatic tire deflects four times as much as a solid tire.

On this basis, it is apparent that the stresses in unsprung parts due to shock, build up to the same amount whether pneumatic or solid tires are used. There is, however, a difference in the time element; that is, the time required to build up the stress due to shock is twice that of the solid tire, in the case of pneumatic tires. If any reduction of the factor of safety is justifiable, it

appears that it is to be done on this basis. As yet we have been unable to conceive a method of testing or experimenting that will prove conclusively how much the factor of safety can be changed because of this time element. Any suggestions along this line will be appreciated. I have, however, taken a 2-ton chassis and installed engines designed for 3-ton trucks, and made the trucks haul 3½ tons of freight very successfully. From numerous other trials like this I conclude that if a factor of safety of 6 is safe with solid tires, a factor of 5 can be allowed for pneumatic equipment. This refers mainly to unsprung parts. Regarding sprung parts, it is difficult even to estimate the allowable stresses. It appears that the factor of safety can be reduced, but not so much as in the case of unsprung parts. For instance, with pneumatic tires, the frame is not deteriorated by shocks in the same manner as when solid tires are used, the rivets stay tight, etc.

The method of carrying spare tires is quite a problem. However, it is worth while to make provision for carrying this spare equipment when designing the body or chassis. Probably the best solution is to place a compartment directly back of the driver's seat, so that the tire can be removed and replaced without disturbing the pay load. The next best place is under the chassis frame at the rear and at the side opposite the muffler.

A power-driven tire pump is indispensable when pneumatic tires are used for the main reason that the truck cannot be moved any distance on a deflated tire without causing serious damage. Even though the truck is equipped with demountable rims and inflated spare tires are carried, there will be times when a single use of the air pump will be worth the cost of the pump. Having the tire pump installed on the truck will facilitate keeping the tires properly inflated and produce better tire

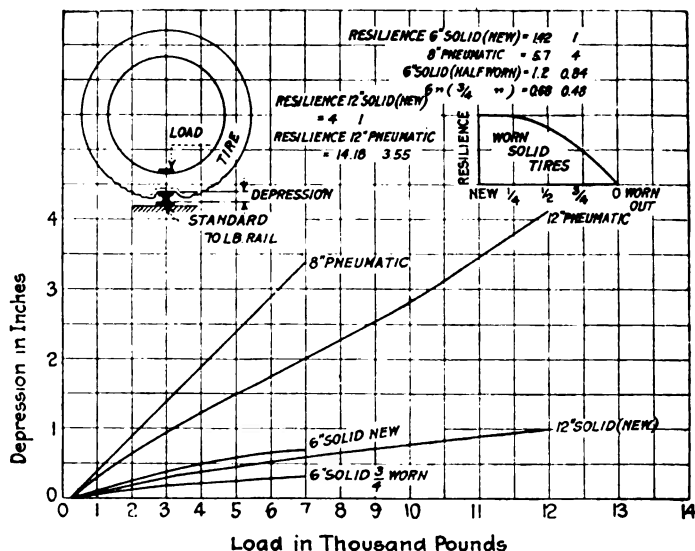


Fig. 8

mileage; this factor alone will easily overcome the cost of the tire pump and in addition yield good returns. This pump should be designed to drive from the transmission. At least this is preferable; a pump mounted on the engine adds to the congestion under the hood, and the small shaft available, already carrying the water pump and magneto, is not strong enough for an air pump. The pump can best be air-cooled, due to its intermittent service and the difficulty of embodying any efficient water-cooling arrangement without much expense. Also, its lubrication should be well worked out, with a view toward avoiding any oil discharge that would injure the inner tube. The speed at which the pump is to operate should not exceed one-half of the governed engine speed and in no case should it be over 600 r.p.m. The pump should operate to permit complete inflation of a 10-in. tire in approximately 10 min. This figure is being realized by several pumps now on the market.

It is worthy of note that a 44 x 10 in. tire contains 5700 cu. in. of air space. The area of the orifice through which the air must pass in a standard tire valve is

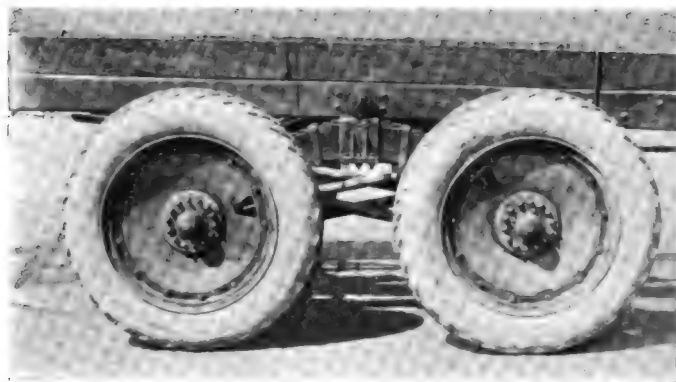


Fig. 10

Front axle, intended for a 3½-ton solid-tire truck.

Frame, 3 x 7 x ¼ in., pressed steel.

Tires, 40 x 8 in., pneumatic; six in all.

On account of the large size and weight of the 48 x 12 in. pneumatic tire for the 5-ton trucks, it was necessary to consider the application of four tires to the rear of the truck, instead of having two of the excessively large ones. The first attempt at an arrangement for applying four small tires to the rear, without using dual tires, which is considered out of the question, is shown in Fig. 9. This consisted of a more or less standard rear axle with a walking-beam adapted to each end and with the wheels mounted upon trunnions from this walking-beam, the springs being mounted upon the axle and attached to the frame on the inside. A chain drive, which, by the way, is about the only feasible drive with this arrangement, was used. This construction ran successfully for about 10,000 miles before a serious failure occurred. Some inconvenience was caused by having the chains jump off and inability to get a brake mechanism that would work. The main point against this design is its enormous weight; however, it served to show that satisfactory tire mileage could be secured from such an arrangement and that there was a good possibility of adapting four relatively small tires to the rear wheel. To develop further this point, the tandem-axle construction, shown in Figs. 10 and 11, was built up. This construction appears to have good possibilities and has at present operated about 3300 miles, 1000 to 1200 miles of which has been on an entirely rough and uneven country road, so rough in fact that it was difficult to keep the front spring tight. The principle of

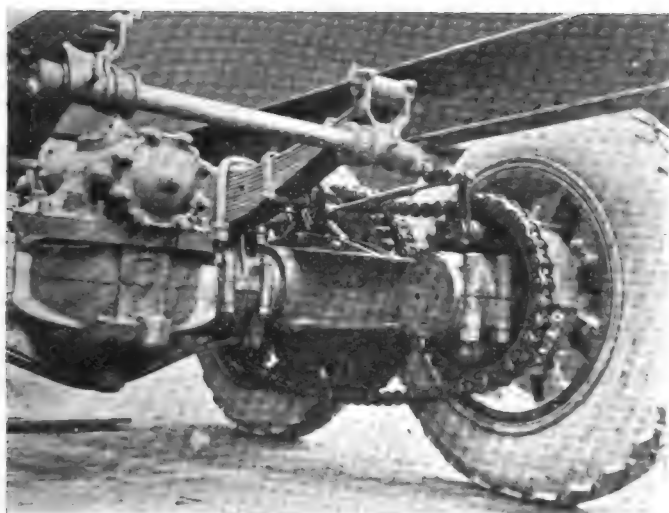


Fig. 9

0.00307 sq. in. Hence, if a pressure of 200 lb. per sq. in. upon this orifice is assumed, the minimum time of inflation of a 44 x 10 in. tire would be about 6 min.

It is debatable whether a two-stage pump is necessary in this service. Certainly, present design would not indicate this to be true, as there are single-stage pumps quite as efficient as any two-stage for this relatively small volume. It is suggested that the air intake on the pumps be piped to a clean point on the truck, perhaps under the seat, thus preventing dirt from being sucked into working parts. At least 6 ft. of copper tubing should be placed between the pump and the hose, to avoid burning off the latter. The advisability of placing a small receiving chamber in the line has been suggested. This would equalize the air pressure and assist in reducing the excessive temperature of the air delivered.

It may interest you to know that my company has under construction at present two 5-ton trucks of six-wheel design. These trucks have the following specifications:

Engine, 5 x 6 in.; four-cylinder.

Transmission, unit power plant and auxiliary; 14 to 1 low-gear reduction.

Rear axle, Goodyear tandem rear. Made up of two worm-drive axles, intended for use on 1½-ton solid-tire trucks in one case, and two internal-gear axles of the same rated size in the other. The rear-axle gear-reduction is 5.8 to 1.



Fig. 11

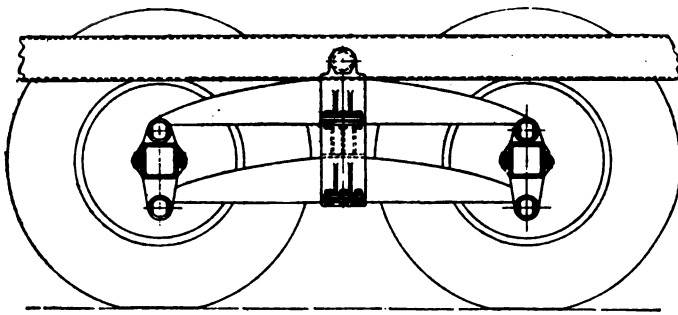


Fig. 12

construction can easily be seen by referring to the illustration. It consists of two small live-axles, with inverted springs pivoted at the center upon the frame and with the ends resting upon the axles. The axles are tied together by crossed torque-rods. The drive is passed through the forward to the rear axle by a short propeller-shaft.

Fig. 12 indicates the possibility of using four springs to tie the axles together and is a very feasible construction to use in connection with the tandem rear-drive. While the drive described here is worked out for a truck of 5-tons capacity, it is equally applicable to one of 7-tons capacity. Some of the advantages the six-wheel truck has over the regular type of the same capacity, on 48 x 12 in. pneumatic tires are:

- (1) Saving in cost.
- (2) Reduction in weight.
- (3) Reduction in axle cost.
- (4) Increased traction.
- (5) Better riding qualities.
- (6) Less damage to roads.
- (7) Larger brakes.
- (8) Greater operating radius.

Compared to the pneumatic-tired four-wheel-truck using tires of large diameter, namely 48 x 12 in., the saving by using four smaller tires is about \$500; sufficient to purchase three or four complete spares.

Each 40 x 8 in. tire weighs only 119 lb., whereas each 48 x 12 in. tire weighs 398 lb. Carrying a spare tire in each case, the total weight reduction in tires alone amounts to over 500 lb. in favor of the 8-in. size. Then again, the 8-in. spare can also be used as a front-wheel spare; this reduces the tire investment still further.

The use of two rear axles in tandem results in the employment of small axles which are in large production with consequent lower costs, instead of the large sizes that are made only in small quantities with relatively high costs. The actual saving amounts to about \$120 per truck. This means that the tandem rear-drive mechanism costs somewhat less than standard two-wheel rear-drive for heavy trucks.

TABLE XI

Lb.

Weight of 5-ton truck axle, exclusive of brake-drum.....	1,660
Weight of two 1½-ton solid tire axles, exclusive of brake-drum	1,200
Saving in axle weight	460
Saving in weight of tires	520
Total saving	980
Less excess wheel and brake-drum weights	77
Net saving in weight due to use of 8-in. tires	903
Saving in weight of radius-rods, springs, etc.	300
Net total saving in weight	1,203

While four 8-in. wheels with the brake-drums, etc., weigh 77 lb. more than the same truck equipment for

12-in. tires, there is a saving in weight of 1203 lb. per truck. The details of this reduction are given in Table XI.

As compared with a solid-tired truck of equal weight capacity, we have the savings given in Table XII.

TABLE XII

Lb.

Weight of two 48x12-in. solid tires and wheels	1,262
Weight of four 40x8-in. pneumatic tires and wheels	1,208
Excess weight of solid-tire equipment	54
Saving in weight of axle	460
Saving in weight of springs, radius-rods, etc.	300
Total saving over solid tires	814

The area of contact of four 8-in. pneumatic tires upon the road is about 27 per cent greater than two 12-in. pneumatics. This additional surface keeps the tires from sinking in soft places, gives better traction under conditions when most needed and in ordinary service the additional area gives better traction. As compared to solid tires in winter service, off of paved roads, etc., the four pneumatic tires have all of the advantage.

The tandem rear drive has about the same advantageous effects over single-axle construction that the pneumatic would have over solid tires. With the tandem combination, when passing over an obstruction in the road the chassis is raised only one-half the distance it would be in the regular type of construction. This reduces the acceleration of bodies upon the chassis to one-fourth that with ordinary construction. Thus, by reducing shocks and vibration, the number and cost of repairs due to fatigue of metal, etc., are reduced by a large percentage.

The tandem construction makes for such exceptional riding qualities that a glass filled with water to within 1 in. of the top, attached to the rear of the six-wheel truck, lost none of its contents even when operated over a decidedly rough and rocky road.

The most destructive factors of the operation of vehicles upon pavements are the wheel-load and the wheel-thrust. Therefore, if one of two tires under the rear end of a standard 5-ton truck bears down upon the road with a pressure of 8000 lb., it will find a great many places where the road will allow it to crush through and once the break is accomplished a rut or chuck hole is started. However, if this single tire is replaced by two that are separated a considerable distance, the pressure of each of the smaller tires becomes 4000 lb. upon the pavement instead of 8000 lb. and a place in the road that will break through is seldom found.

This tandem rear-drive cuts in two the heavy wheel-loads and the thrust as well, thereby making it possible to design pavements suitable for 3½-ton trucks, and carry 5 and 7-ton loads upon them with no increase in their destruction.

The tandem-axle combination has a decided advantage over both the regular pneumatic and solid-tired types in that four brakes of 21-in. diameter are available in place of two brakes of 21-in. diameter, the maximum possible with the two-wheel rear-drive type.

Pneumatic tires permit of doubling the average speed, and the tandem rear-drive will permit increased minimum speeds on bad roads, rough streets, etc.

The design of the ultimate motor truck to use pneumatic tires will in general require the following changes over present solid-tire design:

- (1) Considerably higher rear-axle gear-reductions, ranging from 5 to 8 for pneumatics as against 7 to 16 for solid tires.
- (2) About 15 per cent increase in engine sizes.

- (3) Lower transmission low-gear reductions, ranging from 9 to 14 for pneumatic as against present solid-tire practice of 3 1/3 to 6. This will automatically introduce a fifth speed, which will account for better average road speed.
- (4) Lighter unsprung parts such as front and rear axles and wheels.
- (5) Multiple-wheel construction to accommodate the heavier tonnage, securing the advantages of pneumatic-tire equipment.

Method of Determining Magneto Primary Current at Break

AT a recent meeting of the Physical Society of London Dr. N. W. McLachlan described a method of determining the value of the primary current at the moment of break in a magneto. This method consists in connecting a condenser across the secondary winding so as to reduce the secondary voltage below that required to cause sparking at the safety gap. The peak voltage due to interruption of the current at any speed is found, and then the interrupted direct current which will give the same peak voltage is found, which is equal to the current at break in the magneto.

Discussing this paper Dr. Norman Campbell said that it is quite possible to make satisfactory measurements on the primary current of a magneto by inserting in the circuit a small non-inductive resistance and taking the potential difference across it by means of a rotating "contactor." The total resistance inserted need only be 0.03 ohm; 0.01 for the leads and 0.02 for the measuring resistance. By the use of a suitable potentiometer method a change of 0.02 ampere can then be detected, which is ample for practical purposes. It was found that on increasing the total resistance inserted to 0.11 ohm, the current did not change by as much as 3 per cent; accordingly the disturbance caused by the resistance of 0.03 ohm must be quite inappreciable.

With this arrangement it is possible to test the accuracy of Dr. McLachlan's method by examining whether the secondary peak potential is proportional to the primary current. It was found that it was very accurately proportional when the current was changed by varying the strength of the magnets. By changing that strength within wide limits it seems possible to change all currents and potentials in the circuits without changing appreciably their ratio or wave form.

On the other hand, considerable discrepancies, amounting sometimes to 10 per cent, were found when the secondary peak potential produced by breaking a primary current generated by rotation of the armature was compared with that produced by breaking the same current supplied by a battery. His experience indicated that errors of this order might occur in using Dr. McLachlan's method (allowance, of course, was made for the E.M.F. generated directly in the secondary by rotation of the armature).

The author, in reply, stated that he had tried the method outlined by Dr. Campbell, but without the use of a rotating contactor. The results were unsatisfactory owing to the effect of transients before and after break. In order to eliminate these, it was essential that the contactor circuit should be broken before the primary. This, however, did not eliminate transients before break. Unless the interval between the breaking of the two circuits is small, errors can easily arise. Dr. Campbell's statement regarding resistance only applies at high speeds of say, 700 r.p.m. or more. At low speeds, owing to the small value of the primary inductance reactance, the current is nearly proportional to the resistance.

If the method of measuring the voltage drop across the resistance to one which gives the peak value, the current at break is measured only when the maximum value does not occur before break. If the maximum occurs before

break, as it does at retard, the peak voltage across the resistance is not a measure of the current at break, although the values so obtained may be proportional to the secondary voltage of the magneto found by altering the strength of the magnet. The question arises as to whether the peak voltage—due solely to interruption of the current, as found by Dr. Campbell's method, is proportional to the current broken when the speed is varied.

There are several ways in which discrepancies may arise in measuring the peak voltage by breaking a direct current in a magneto: (1) If the direction of the current is different from that during rotation, errors of the order mentioned by Dr. Campbell may occur. This can be tested by moving the armature through 180 electrical degrees and repeating the experiments. (2) The position of the armature at break must be found fairly accurately, since the polarisation of the core due to the magnet varies with the armature position. Polarisation affects the primary and secondary effective resistances and inductances, also the flux change due to a given current. These react on the peak voltage. (3) The peak voltage found by breaking a direct current (flowing in the proper direction) at advance or retard is not the same for all armature positions. This is probably due to some asymmetry. (4) The rectifying valve should pass no reverse current, and at low armature speeds the leakage should be extremely small. (5) Great care must be taken to prevent sparking at the separate contact breaker used for calibration. If sparking or rather arcing occur there are variations in the peak voltage, and the battery and rheostat part of the oscillatory circuit.

Growth of German Air Force

ON the occasion of the recent Boelke anniversary the Aero Club of Berlin published some interesting figures showing the growth of Germany's air forces during the war. These are as follows:

	Aug., 1914.	Nov., 1918.
Machines (fighting, bombing, scouting)	246	4,050
Escadrilles for defending the interior..	18	108
Pilots at the front.....	500	5,000
Personnel in the interior.....	500	80,000
Monthly consumption of fuel, litres....	600,000	7,000,000
Machines fitted with cameras.....	100	2,000

QUITE often a certain line of research work will produce results not at first contemplated but perhaps as important as the result of the main investigation. In connection with the development of the large precision altimeter by the Bureau of Standards it has been discovered that a very useful improvement can be made in the method of support of the mainspring of commercial altimeters. After making this improvement in certain instruments, tests show that the lag has been reduced to one-half its original value.

Weights and Measures Useful in Truck Body Building

These tables will become more and more useful as the influence of the truck is extended and as it becomes necessary to draft fixed rate schedules for freight carrying routes. But especially is the manufacturer interested in these items in advertising trucks for special purposes.

Building and Contractors' Material

Asphaltum—87 lb. per cu. ft.

Brick—

Soft, 4.32 lb. each; 2.16 tons per 1000; size, 2¼x4x8¼ in.

Common, 5.4 lb. each; 2.7 tons per 1000; size 2¼x4x8¼ in.

Hard, 6.48 lb. each; 3.24 tons per 1000; size, 2¼x4x8¼ in.

Cement—Portland, barrel weighs 380 lb.; equivalent to 4 bags.

Rosendale, barrel weighs 300 lb.; equivalent to 3 bags.

Western, barrel weighs 265 lb.; equivalent to 3 bags.

	Lb. per cu. ft.		Lb. per cu. ft.
Clay—Dry	63	Earth, loose	76
Wet	110	Gravel	95
Crushed stone	100	Sand—Dry	97
Concrete	138	Wet	118
		Mortar, set	103

Coal and Coke

Kind and size	Weight per cu. ft.	Number cu. ft. per ton
Connellsville coke	26.30	76.04
Anthracite—Nut	56.88	35.16
Stove	56.33	35.50
Egg	56.07	35.63
Cannel	49.18	40.66
Bituminous—Illinois	47.22	42.35
Iowa lump	46.51	43.00
Indiana block ...	43.00	46.50
Pocahontas—		
Egg and lump..	52.27	38.28
Pittsburgh	46.48	43.03

	Weight per cu. ft.	Number cu. ft. per ton
Charcoal—Hardwood	19	105.25
Pine	18	111.11

Cotton

Bale weighs 515 lb.; measures 27x27x54 in.; contains 23 cu. ft.

Eggs

In crates containing 30 doz., 53 lb.; crates measure 30x12x12 in. (10 lb.).

Milk

10-gal. can containing about 87 lb. of milk weighs 115 lb.; can measures 26 in. high, 14 in. diameter.

Case of 12 quarts weighs 63 lb.; measures 18¼x14¼x12 in.; weight of case and empty bottles, 33 lb.

Hay	Weight, lb.	Length, in.	Width, in.	Height, in.
Hay—Standard bale ..	210	46	30	26
Small bale	120	43	24	18
Straw—Standard bale..	180	46	30	26

To estimate the weight of hay in a mow or stack or a truck, allow 514 cu. ft. for a ton.

Size of Barrels and Baskets

Bushel (U. S. Standard) equivalent to 4 pecks, 32 quarts, 64 pints; contains 1.2445 cu. ft., 2150.42 cu. in. Average bushel basket measures 18½ in. top diameter; 11½ in. high.

Bushel crate measures 14 in. wide, 17½ in. long, 12¼ in. high.

Barrel

(U. S. Standard for vegetables, fruit and dry commodities, except cranberries.)

Capacity, 7056 cu. in.; 105 dry quarts; 3.281 bu.

Head diameter, 17½ in.; bilge diameter, 20.37 in.; stave length, 27½ in.

Capacity, 5826 cu. in.; 87 dry quarts; 2.709 bu.

Head diameter, 16¼ in.; bilge diameter, 18.62 in.; stave length, 28½ in.

Flour Barrel

Weights 200-220 lb.; bilge diameter, 21 in.; head diameter, 18 in.; stave length, 28½; 28 lb. per cu. ft.

Sugar Barrel

Weights 300-360 lb.; bilge diameter, 25 in.; head diameter, 20½ in.; stave length, 30 in.

Syracuse Salt Barrel

Weights 280 lb.; bilge diameter, 21 in.; head diameter, 18 in.; stave length, 29 in.

Syracuse Salt—Per bushel, 56 lb.; per cu. ft., 49 lb.

Turks Island Salt—Per bushel, 80 lb.

Liquids

	Weight, lb. per gal.		Weight, lb. per gal.
Alcohol	6.75	Oil—Linseed	7.5
Gasoline	6.6	Lubricating	7.65
Kerosene	7.	Vegetable	7.65
Molasses	12.5	Petroleum	8.
Muriatic acid	9.62	Sulphuric acid	15.25
Nitric acid	11.7	Turpentine	7.2
Oil—Fuel	7.25	Vinegar	8.4
		Water	8.33

Snow and Ice

Snow—Fresh, 5-12 lb. per cu. ft. Wet, 15-50 lb. per cu. ft.

Ice, 57½ lb. per cu. ft.

Ice—(Standard block), 350 lb.; measures 11 x 22 x 44 in.

Miscellaneous Commodities

	Pounds per cubic foot		Pounds per cubic foot
Ashes	42	Paper	58
Garbage	50	Rubber	59
Glass—Common	162	Rubber goods	94
Plate or crown	161	Saltpeter	69
Crystal	184	Starch	96
Flint	247	Street sweepings	31.5
Leather	59	Sulphur	125
Wool—Pressed	82		

Angles of Incline Necessary to Dump Commodities From Steel Lined Bodies:

Material	Degrees	Material	Degrees
Ashes—Dry	33	Concrete	30
Wet	36	Earth—Loose	28
Brick	40	Compact	50
Clay	45	Garbage	30
Coal—Hard	23	Sand	35
Soft	30	Stone—Broken	27
Coke	23		

Road Resistance

As measured by pull in pounds per ton:

Over level, unsurfaced, concrete road.....	27.6
Concrete base, ¾-in. skin top asphaltic oil and screenings	50.0
Water-bound macadam, level, good conditions	64.3
Concrete base, 1½-in. Topeka top, level, good conditions..	68.5
Gravel road, level, good conditions.....	80.0
Earth road, level, fine dust, ¾ to 2 in. deep.....	99.3
Earth road, stiff mud on top, firm underneath, level.....	218.0
Loose gravel, new road, level, not packed down.....	263.0

Newspaper

Rolls weigh 1200 lb.; length, 72 in.; diameter, 32 in.

Venezuela Looks to the United States for Cars and Trucks

Having a broad system of 1800 miles of improved highways and an industrial system lacking rail transportation, this South American republic depends largely upon automotive equipment for her future development. This interesting article is written by a business correspondent who has recently returned to the United States from a lengthy visit to that country.

By Harry Chapin Plummer

PARADOXICAL as the statement may seem, Venezuela, which is rapidly forging ahead as an industrial nation, has come to depend upon the automotive industries of the United States, and, in particular, upon motor-truck manufacturers, for the advancement of her progress among the producing countries of the world. The American automobile has helped the people of Venezuela to find themselves and to test and to realize their own remarkable efficiency.

The construction of a chain of 1800 miles of superbly equipped motor-highways, linking the Caribbean gateways of the country and the capital, Caracas, with such vital interior centers as Valencia, Maracay, Barquisimeto and the cities of "Los Andes," with the *llanos* of the Orinoco basin and with the frontiers of Colombia, Brazil and the Guianas, is among the first fruits of a change of policy upon the part of the Venezuelan Government whereunder railroad expansion has been halted and the *carrteras nacionales*, as the new highway system is known officially, have been "pushed to the limit."

This nearest of South American republics—Venezuela—lies on a latitude actually north of Costa Rica and considerably nearer the mainland of the United States than the Panama Canal—has suffered socially, economically and politically ever since, in 1823, a son of her own soil, Simon Bolívar, freed her and her sister states, Colombia, Ecuador, Bolivia and Peru, from the yoke of Spain, for lack of means of internal communication.

The Cars in Venezuela

While the Orinoco and its tributaries drain a vast area of the more southerly *llanos* and the Lake of Maracaibo and the Rio Catatumbo, which flows thereto, afford an egress for a good-sized region at the western extremity of the coast, Venezuela, until the second decade of the twentieth century, had little or no medium for ordinary vehicular traffic. The country depended almost entirely upon the "old Spanish trails," which were little more than burro paths and well nigh impassable in the rainy season. The few railroads served but a fraction of the republic's population and area. There are today only 1039 kilometers (645.37 miles) of railroads actually under operation. These are mainly confined to the seacoast proper.

With the coming of the new motor highways, Venezuela took to motoring and today the city of Caracas, with a population of 100,000, counts 1000 privately owned automobiles, a ratio of one car to every one hundred inhabitants. With few exceptions, these are American-made cars, with the Hudson, Essex, Ford and Buick enjoying by far the lion's share of the trade. Aside from the competitive and manifestly effective salesmanship that

has given the cars named their advantage with the Venezuelan public, the types of construction they represent seem to have met the peculiar physical demands of the new highways, which are distinguished for heavy inclines and frequent sharp curves, especially in the more mountainous regions about the capital and the coast.

The development of utmost significance, however, is not the encouraging number of Yankee automobiles owned and used, but the fact that every one of the country's many industrial plants—they comprise large cotton and paper mills, leather tanneries, sugar centrals, cigarette, boot and shoe, saddle, trunk, baggage equipment, match, cement, ink, glass, soap, perfumery and hat factories, breweries and an abattoir and meat-freezing establishment at Puerto Cabello—depend more upon a spur to their receiving and shipping platforms from each of the smooth, broad highways on which they are situated than upon a railroad siding. Few of them, indeed, have immediate railroad connection.

The Need for Cars and Trucks

I have cited Venezuela's budding industrial status mainly because that is the condition and the feature that most forcibly impresses the American who visits there. If the manufacturing interests have need of a quick and dependable medium for the movement of their products to the principal markets and distributing centers of the republic, as, also, for that of their equipment and supplies, both imported and domestic, how vastly more manifold must be the requirements of the older, settled agrarian and mining industries.

In a remarkably comprehensive survey of the industrial resources of Venezuela, as divided into three zones—agricultural, forestal and mining—which but lately has been prepared in Spanish and in rarely good English by Dr. N. Veloz Goiticoa, charter member of the Venezuelan section, Inter-American High Commission—the aggregate of capital invested in the cultivation, development and recovery of the products of the three zones named is placed at 1,175,186,966 bolivares (\$235,037,393). Almost any one of the divisions or subdivisions would present a weighty transportation problem. It is a foregone conclusion that these problems will have to be studied and solved by the American motor-truck manufacturer.

With a due and proper respect for the enterprise and the efficiency of the European and Canadian competition to be encountered in Venezuela and to the high standard of its products, as, also, for the price and credit considerations by which it oftentimes places the American importer at a disadvantage, it is clear that the Venezuelan business interests will follow the example of the Venezuelan motor-

Custom and Freight Duties to Venezuela

Tariff (Venezuela)	Per kilo Bolivares	Per 100 lb. In dollars, including surtaxes	Freight			
			La Guaira and Puerto Cabello		Maracaibo and La Vela de Coro	
			Per cu. ft.	Per 100 lb.	Per cu. ft.	Per 100 lb.
Automobiles of all kinds, including tools necessary for their operation	B. 0.05	\$0.69	\$0.30	....	\$0.30	....
Automotive equipment not otherwise specified	0.75	10.28	0.30	....	0.30	....
Iron or steel tires	0.25	3.43	....	0.50	....	0.50
Rubber tires	0.75	10.28	0.30	....	0.30	....

These freight rates are subject to additional charges, viz.: 5% primage + 75% surcharge + \$0.04 per 100 kilos.

NOTE—Insurance rates depend upon the standard of seaworthiness of carrier. They are naturally higher with older boats.

touring public in deciding in favor of the American car. Although merchandise from the Old World commands the respect of the Venezuelan buyer and especially so that partaking of the character of luxuries or semi-luxuries, for all things mechanical he looks to the United States. Notably is this the case with the automobile and, in particular, with the cars already named, because they have stood up under the exacting tests imposed by the Venezuelan terrain. So it is not to be doubted that the American motor truck will come to enjoy the actual supremacy when the time comes—and it now appears to be close at hand—for importing it in appreciable numbers. Had the European motor truck been found adaptable to the conditions of usage prevailing in Venezuela, it would have been introduced there long ago, along with the European pleasure car.

The new *carreteras nacionales*, while being of vital strategic influence to Venezuela, are of extreme economic significance to the manufacturing and exporting interests of the United States, quite apart from the automotive industries, in that they open up to American commerce sections of the republic that hitherto have been untouched by Yankee trade. Among these is the Cordilleras of the Andes, with historic and beautiful and cultured cities such as Merida, Tachira, Trujillo and San Cristobal that are the centers of areas of prolific yield in coffee, cocoa, sugar, corn and grain and other foodstuffs.

Venezuela emerged from the economic chaos created and inflicted by the world war in a better financial condition than any of her sister Latin-American nations. Of all the world's states, she was among the few that, during the conflict, regularly and punctually amortized her debts contracted abroad. This extraordinary fiscal position to be attained by a nation of such limited population—there are less than 3,000,000 people within the confines of the Land of Bolivar—has had the effect of placing the Venezuelan unit of currency, the Bolivar (normally equivalent to 19.3 cents in American coin) upon an enviably sound basis, wherein it has reacted to amazing premiums over its normal equivalents in the standard currencies of this country and Europe. Venezuela is enjoying an unprecedented degree of prosperity.

Dr. Luis Vélez, minister of public works of Venezuela, has thus described the advantages looked to be derived by yet another region of the country from the *carreteras nacionales* and, in particular, from the "Gran Carretera Occidental de Venezuela," which extends for 897 miles from the capital, Caracas, to San Cristobal, on the Colombian frontier:

"The benefits that must accrue to the country from this central highway are manifold and of transcendent importance. In fact, this great artery, by its extraordinary magnitude and importance, must not only develop vigorously the economic life of the regions that it traverses, but it must actually save from stagnation the important states of Southwestern Venezuela, Cojedes, Portuguesa and Zamora."

From the foregoing the idea will be gained that the

primary opportunities afforded by the development of the Venezuelan *carreteras nacionales* must be realized by the American manufacturer of motor trucks. Scarcely less abundant are the opportunities opened up to the maker of passenger cars. Indeed, the total of cars purchased within the last few years in Caracas represents an insignificant fraction of the trade yet to be accomplished there, based upon the entirety of population of Caracas and of the other communities of the republic and upon the collective wealth and buying power of the people.

The Type of Truck Needed

As the actual transportation needs of the country are considered, the prospects become ten-fold amplified, yet with their amplification the business to be done partakes more and more of the character of specialization. Motor cars and motor trucks, as generic terms, apply up to a certain stage; beyond that the line of trade diverges in many branches, as the limbs of a tree, with the two main types forming always the root and trunk.

Even the building of the national highway system brought to the fore the question of a special design to combine the functions of roadster and truck, which was eventually evolved by the Ford car. This is outlined by the Ministry of Public Works in a recent official report on highways construction in the State of Tachira, as follows:

"The method of development of the Carretera Central de Tachira has brought forward a fact which we consider too interesting to omit mention of—that is, that trucks of great burden and, in consequence, of heavy weight, have not given practical results for road maintenance or for traffic on these highways. The cargo vehicle most truly efficient, without any doubt, is the small truck of from $\frac{3}{4}$ -ton to 1-ton capacity, at the most, or, perhaps, even better, of $\frac{1}{2}$ -ton.

"There actually has been constructed in the Ford factory in the United States, by direction of this ministry and destined for use on our highways for their conservation, a type of small truck of $\frac{1}{2}$ -ton capacity, which we consider to be of great utility, not only for the service of transporting materials, such as broken stone, lime, cement, sand and even metal pieces for bridges, but also for the rapid conveyance of inspectors and chief employees of the road conservation."

Directly dependent upon the solution of the interior transportation problem in Venezuela is one of the first of the republic's industries—that of cattle raising and shipping. There range on the broad, fertile *llanos* approximately three million head of horned cattle, representing an investment of 115,000,000 Bolivares (\$23,000,000). The cattle industry sends by far the major portion of its product to Puerto Cabello. There, in the English *Congelacion de Carne* and under the technical direction of experts from Illinois, Kansas and California, cows, bulls and oxen are killed and prepared in many forms—beef, hides, bone and bone meal—for export to England, France and Italy and, in the case of the latter by-product only, to the United States.

Until the recent completion of the 56-mile highway from the interior industrial city of Valencia, which is the focal point and clearing house for the cattle trade of the highland *llanos*, to Puerto Cabello, this valuable traffic depended mainly upon an old Spanish trail, with a costly alternative in the Puerto Cabello & Valencia Railway. The latter is not equipped with rolling stock of a type suited to the movement of cattle, and the heavy grades and train shunting on which, naturally, increased the hazard of conveyance. This parallel highway and railway stretch from Valencia to Puerto Cabello represents but the relatively short final stage of a long and laborious journey from the inland *llanos* about the basin of the Orinoco and its tributaries. Until the building of the *carreteras nacionales*, this was negotiated over the poorest conceivable roads, which were little more than mere trails. There was, and there is now, no way for cattle to move from the southerly region of the *llanos* northward to Valencia and Puerto Cabello save on the hoof.

I have endeavored to sketch cursorily a condition confronting the cattle raisers and shippers of the *llanos*. Vaguely as it has been drawn, I believe it will suggest the excellent opportunity that exists for the motor truck designed specifically for the transportation of livestock, such as is now in use for that purpose within prairie areas about the larger packing centers of the western United States. Such a vehicle would be of inestimable value in getting a definite number of head of cattle from a flooded area to shelter or to places of relative safety in time of flood, and it unquestionably would minimize loss and depreciation over the heavy grades on the trans-mountain sections of highway toward the coast.

Manufacturers and shippers of automobiles and motor trucks need have not the slightest fear that in the event of their machines exported to Venezuela becoming damaged or out of repair, they cannot be put speedily into condition. There are many well-equipped garages and assembling plants in the chief cities and "gas" and pumping and tire repair stations in even the smaller communities. True, the general aspect of these would not bear comparison with the ultra-modern plants of like character in "the States." A disordered environment and working condition is easily mistaken for lack of system and of efficiency in Venezuela.

Actually I doubt if there is a more skillful, painstaking and thoroughly competent or more honest class of labor to be found on the Western Hemisphere than the *trabajadores* of Venezuela. It is made up, in the coast areas, of

negro and negro and white, and on the interior *llanos* and in the mountain regions of Indian and Indian and white.

The Venezuelans are a people of inherent arithmetical and mechanical sense. Hence it is that complicated and delicate machinery and motors are not only well conserved when entrusted to native hands but are very rarely returned to American, Canadian or European manufacturers for repair. Damaged or missing parts are sent for and the repairs effected in Venezuela.

Supervising mechanics in Venezuela are invariably graduates of the Escuela de Arte y Oficio (School of Arts and Technical Crafts) of Caracas, whose instructors have all trained at the principal technology institutes of the United States.

Gasoline, or petrol, as it is known in the republic, is obtained from wells in the State of Zulia, near the Lake of Maracaibo, which are under the operation of Venezuelan, British and American corporations—in the latter case the West Indian Petroleum Co., a subsidiary of the Standard Oil Co. of New York. The retail price has advanced appreciably in recent years and now ranges around 60 cents per gallon.

Conditions governing the shipment of automobiles and trucks into the republic present no serious obstacle, physical or monetary. At three of the largest ports which are termini for the State motor highways, La Guaira, Puerto Cabello and Ocumare de la Costa, the machine may proceed under its own power from the ship's side at commodious docks, although in the case of the former, the La Guaira Harbour Corporation, which exercises a monopoly of docking and entry privileges, imposes many restrictions and charges that well-nigh compete with the customs duties of the nation. The most of the passenger cars shipped from the United States to Caracas within the last few years have been sent up to the capital by railroad and their stationary parts and accessories assembled at destination, but they could just as well be sent over the superb trans-mountain motor road between the two cities, under their own power.

What the opportunities are in Venezuela for the automotive industries of this country may be most practically set forth, perhaps, by a citation of the motor imports into the republic for the fiscal year ending June 30, 1919. These comprised 190 cars, valued at \$193,529, and auto parts valued at \$85,864. In the first four months of the present fiscal year the imports were 123 cars valued at \$177,199, and 12 trucks valued at \$9,196. Five years ago the imports "totaled" a single car.

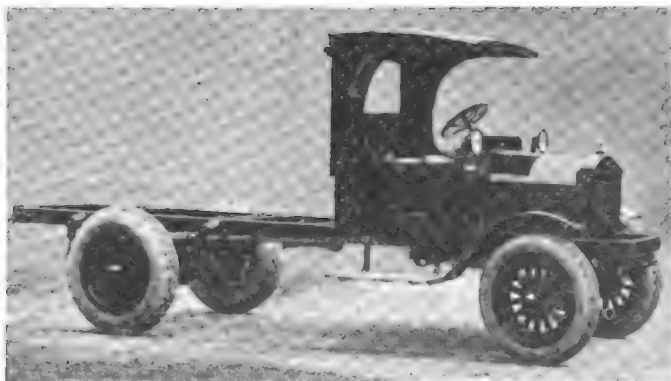
Automobile Types for Spanish Trade

THERE is no one type of truck or automobile used exclusively in any particular country, and yet there are models for which there are extensive demands apparently founded on national characteristics or local preferences and requirements. We illustrate herewith a truck which the Quaker City Corp. has been successful in placing in both Spain and Cuba.

This is a 2½-ton truck, built for use in Madrid, but a large number of the same type have been assembled by the company in Havana for the Cuban trade. The equipment includes a Hercules engine, a Westinghouse starter and Bosch ignition. In addition to the 2½-ton type, there has been a considerable demand for 5-ton trucks and also for passenger cars.

The bodies for the overseas passenger cars will be assembled in Spain, but all hardware used in the construction will be purchased in the United States. Madrid and Barcelona are stated to be the two Spanish centers of demand for these types, and companies have been formed

for assembling the parts. In its Cuban trade, the company reports an active market for sugar cane trailers.



A truck for Spanish trade

The Course of Labor and the Strike Tendency in Great Britain

The community of feeling between the United States and England and the similarity in customs, characteristics and action of the Anglo-Saxon, regardless of geographical locations, make this exposition by Mr. Northcott of value to Americans. It should be considered that economic trends in this country indicate our workers are striving to reproduce at home what has been accomplished across the Atlantic.

By Clarence H. Northcott

THE significance of this story on conditions in Great Britain will be understood properly, if the reader will bear in mind that the proportion of labor unionists to the population in that country is 400 per cent greater than in this country, one in every six or one in every seven of the population are members of a trade union. This means that, in most of the important industries, the trade unionists are either the total number of employees or so large a majority that their influence is exerted as though they represented the whole. Furthermore, they have controlled the rules and regulations in respect to working conditions, amount of production, hours, holidays, etc., for a sufficient number of years to have given them an opportunity for consolidating their power, and industry is accustomed to deal with and through these organizations not only in respect to strikes but in respect to all the minor questions and the rules and regulations as to employment which are coming up constantly.

Because of the complete industrial character and the trade union power in Great Britain, the action taken there will have a great bearing on the actions of the labor and economic political organizations in this country. It is for that reason that an understanding of conditions in Great Britain is absolutely necessary.—*Editor.*

THE temper of labor in Great Britain since the signing of the armistice has been a subject of world wide concern. The end of the war meant to the laboring masses an opportunity for which they had waited long and which they have exploited to the full. During the war, with some few exceptions, they had given of their best towards the nation's gigantic effort. They had agreed to give up certain rules, practices and customs which, no matter how restrictive they were in tendency and in fact, represented to them their chief bulwark against capitalism. Their leaders had surrendered the right to strike in order to further the nation's effort. In the process of administering the Munitions of War Act, which organized the national effort in munitions, certain rights and privileges were seriously abrogated. Compulsion of an obnoxious kind was exercised so that men were fined for absence from work, or were forbidden to leave their employer's service except after the fulfillment of conditions that savored of servitude too much for the British workers' liking. The nature and actions of the tribunals before which they were tried, the fact that their leaders were getting out of touch with the rank and file and the extent of the repressive

measures taken by the government when strikes had occurred during the war period, had produced a revolutionary position.

This revolutionary fever had become quite evident during the war. Serious strikes occurred in such munition centers as Glasgow and Coventry which were repressed only with severe measures against the leaders. The "rank and file" movement threatened to disrupt trade unionism by throwing over the authority and promises of the leaders. The shop steward movement not merely fostered this tendency to disruption within trade unionism, but also gave organization and leading to the forces which were out for the overthrow of capitalism and the State. When the armistice was signed, then, there was every reason to expect a stormy period for labor.

The organization of labor afforded further ground for the same fear. Trade union membership had greatly increased. In 1913 its registered membership was estimated at 4,192,000; at the end of 1918 it had become 6,624,000, an increase of 58 per cent. The clothing trades had increased 98 per cent from 1914 to 1918, the metal trades 75 per cent, while the general labor group had more than trebled in the period. During the year 1918 six unions, covering this group of unskilled laborers, added 427,000 to their membership. This increase in numbers was accompanied by federations and amalgamations among the larger unions. The most conspicuous and ominous instance of this tendency was the triple alliance of miners, railway men and transport workers. These had pledged themselves to common action under certain conditions. It was obvious that these three groups, which totalled over a million and a half of the most highly organized British workers, held a strategic position. Common action by them at the same moment would tie up British industry and precipitate something approaching a revolution. In the early months of 1918 they were each presenting separate and far-reaching demands that stood a fair chance of refusal in each case, thus producing a situation in which the triple alliance might act.

The newly awakened social sense of the workers afforded them further occasions for trade union activity. From the war they had learned the value, to them as citizens, of good wages and increased leisure. When the war ceased, therefore, they began a movement for increase in wages and reduction in hours. While, in most cases, the organized unions approached the equally organized employers in order to negotiate these issues amicably, there were many instances in 1919 where agreement was reached only after a serious and disastrous strike.

There was every reason, therefore, to expect that the year 1919 would be a stormy period in the industrial history of Great Britain. Figures recently made available show that the expectation has been realized. The year 1919 was not as stormy as 1913, if measured by the number of disputes, and not so serious in its effect upon production as the year 1912, if measured by the number of working days lost. The years 1912 and 1913 were periods of great industrial turmoil. In the former year a prolonged strike occurred in the coal mining industry. The experience of the year 1914 prior to the outbreak of war showed, in conjunction with that for the two previous years, that labor was becoming extremely militant. This militancy was largely laid aside during the war. The loss of working days and the number of workers involved in disputes during the war did not reach the totals for any one of the years 1912, 1913 or 1919. The experience of the last year, therefore, represents the combined result of the postponed questions of four years of war.

The total number of disputes in 1919 was 1,413. The total number of workers involved was over two and a half million, and the aggregate work days lost was 34,483,000. This last figure is equivalent to the loss on every working day of the year of the labor and services of about 115,000 workers. While this number is quite a small percentage of the total workers of Great Britain, it is a significant percentage of the strategic industries in which the disputes have occurred. The principal industries affected have been coal mining, the metal trades, the textile and the transport industries. The reasons leading to disputes in these industries show a combination of the causes analyzed above.

The Sankey Report

Thus, the Yorkshire coal miners, numbering 150,000, struck for 13 days in January, 1919, in order to enforce a simultaneous interval for mealtime for men employed on the surface. In July of the same year, these miners were idle for 19 days because a satisfactory advance in rates had not accompanied the reduction of hours in coal mines under the Sankey award.* Prior to the sitting of the Sankey commission, 100,000 miners struck for six days to support the demand for an advance in wages which was to form the chief matter for investigation by the commission. The reduction in hours in the metal trades was the occasion in January of a stoppage of work on the part of about 150,000 workers. The arrangement of hours in the factories and foundries cut across many of the established domestic and industrial customs of the workers, who accordingly struck. Part of the trouble arose from the non-provision of an increase in piece rates to compensate for the reduction in hours so that the workers' weekly earnings should be the same. The moulders' strike which lasted from September into 1920 affected 50,000 skilled men. An endeavor on the part of the cotton operatives to obtain reduced hours with correspondingly higher piece rates, resulted after long and fruitless negotiations, in a strike occupying 18 days in June and July, and affecting 450,000 workers. The week's strike on the railway at the end of September, which involved half a million workers, was also a wage question. In sum, the chief subjects of dispute in 1919 were wages and hours.

Concrete illustration of this is afforded by an analysis of the causes of the principal disputes for any one month. If July be taken, one finds a strike in the building trades

*The Sankey commission was formed during the latter part of the war, of representatives of coal miners, owners and the public to consider the mining industry and the grievances of the workers. Judge Sankey was the chairman. Its report made drastic recommendations for changes and severe criticisms of the present methods and conditions.

at Plymouth against the refusal of the employers to pay increased rates of wages awarded by a conciliation board, pending ratification by the Ministry of Labor. In coal-mining, there was trouble in Northumberland and Durham over the arrangement of hours under the Sankey award, and in Yorkshire over the amount of advance on the piece rates to compensate for the reduced working hours under the same award. Metal trade workers in South Wales struck for a flat wage of £5 a week in place of a sliding scale. Hosiery workers in Leicestershire refused to accept a reduction of hours to 48 per week to which were attached provisions for the future working of overtime, introduction of extra shifts and the non-restriction of output. Some paper-mill workers struck over hours of labor and rates of wages in connection with the introduction of the three-shift system. Several other disputes are recorded, all of which turned on wage questions.

This record of industrial disturbance is, on the surface, extremely alarming. But two undoubted facts considerably offset the significance of this record for the future. In the first place, the temper of labor has grown more moderate. The ominous shadow of the triple alliance is no longer thrown over the industrial landscape. Either it was too loosely integrated or its leaders had too large a proportion of the British caution and common sense. It never really threatened anything detrimental to society and its weakness has made it a subject of reproach among those "direct actionists" who hoped through it to attain the industrial millennium. The demand for "direct action," that is, for the strike as the surest means of securing what the workers want, has been defeated by the British preference for political action. Labor has been sobered by its responsibilities and by the opportunities which are opening before it. Before long, the government of these historic islands, whose record in the world's struggle for freedom and liberty dates back to Magna Charta, will be in the hands of the Labor Party. The greatness of the responsibility thereof, and the hopes and potentialities awakened thereby, have added caution to zeal, and moderation to enthusiasm.

The second significant fact of importance in estimating the present strike situation is the development of the spirit and method of negotiation and conciliation. While such trouble as the figures for strikes indicate was caused by inability to adjust a great number of rather extraordinary demands, in the majority of cases equally extraordinary demands were met by negotiation. In the case of some of the more serious strikes, a considerable effort at adjustment had preceded militant action. The strike in the cotton centers followed upon months of fruitless endeavor to reach a settlement. The railway trade unionists have been in continual conference for months with the representatives of the Board of Trade and the Ministry of Transport. Their strike in September last was a protest against the slowness with which the negotiations were proceeding and was aimed to force a definite offer from the government.

Conciliation and Negotiation

The miners, as all the world knows, accepted a commission of inquiry and, later, accepted its report. On the refusal of the government to accept the second Sankey report favoring nationalization, the miners set to work upon an educational campaign throughout the country to convince the public concerning their plan, its feasibility and its necessity. The dock workers, instead of calling a strike, have obtained a commission of inquiry and are presenting their case like men who are reasonable and can afford to have their demand judged impartially on all the evidence. The engineering and shipbuilding unions,

probably as militant as any in Great Britain except the miners, are at present in weekly session with employers over a number of pressing matters. The negotiations are said to have broken down but that does not diminish the significance of the preference for conciliation and negotiation. In a great number of other trades wherein considerable alterations in wages and hours have taken place, there has been an even greater degree of successful negotiation.

This is due to two reasons. In the first place, British employers have come to recognize the principle of collective bargaining and have developed on their side a network of representative organizations. These have a twofold object, one of which is, in some form or other, to negotiate with trade unions. Many of the bigger industries have a definite, agreed system of negotiation, which is never called into use while men are on strike. The presence of this machinery for the settlement of disputes is a check upon precipitate action, while the condition that strikers must return to work before they can have the opportunity for negotiation, cuts disputes short.

In the second place, there has been a great development of conciliatory machinery, mainly of the governmental type. An industrial court has been set up to which parties may refer disputes by joint consent. The act which established this court authorizes the Minister of Labor to set up an independent commission of inquiry where the circumstances seem to call for such action. It is under this provision that the dockers have been enabled to present their case before the bar of public opinion. The Whitley Councils,* established in over 50 trades, with district councils in several instances and with preliminary interim reconstruction councils in many others, have afforded opportunities for negotiations concerning almost

*The Whitley plan of industrial conciliation, so called because it was promoted by Mr. Whitley, calls for a National Industrial Conference participated in by representatives of employers' groups, trade unions and the public to consider national differences, and district councils similarly constituted to take care of local questions.

any aspect of industry on which discontent could arise. No other machinery, outside of that set up in several of the older industries by joint agreement between employees' associations and trade unions, affords such scope and facility for negotiation. It has one defect, in that the agreements reached are binding only on such employers as are members of the councils or are represented thereat. This defect is remedied in the case of trades which fall under the provisions of the Trade Boards Act, which can be made to apply to all employers in a trade in which a Trade Board has been set up. Since the amendment of the Act in 1918 there has been a great increase in the number of trade boards, and greater facility, therefore, for the settlement of irritating questions. In sum, the machinery just described is an unanswerable argument against the necessity for striking to obtain redress, justice or equity in industrial matters.

The future tendency of strikes in Great Britain is difficult to forecast. In general, labor has become more moderate and is availing itself to a greater degree of the machinery of conciliation above described. But it is not becoming more content with the present economic system.

It is out to nationalize the leading industries such as the mines, the railways, shipping, and other forms of transport. It objects to the private control of industry and to the use of the process of manufacturing for the making of private profits. The workers consider profits an unnecessary and unjust payment and hold that industry should be a social service. They want also a share in the control of industry, thereby voicing their protest and almost rebellion against the autocracy which prevails in management. They are, in fact, in revolt against the whole present economic system.

While such a spirit is abroad and such an aim is before the minds of the workers, strikes are not likely to cease. At the best, they may be expected to diminish in numbers and intensity just in proportion as the workers see before them the possibility of realizing their aims.

Czechoslovak Trade-Mark Law

UNDER the trade-mark law of the Republic of Czechoslovakia, enacted on July 24, 1919, according to Trade Commissioner V. A. Geringer, trade-marks which had been registered with any chamber of commerce in the former Austro-Hungarian empire, to the day of enactment of the new law, will be protected in the territory of the Republic with the priority of the original application if the owner of the trade-mark notifies the proper chamber of commerce in the Republic that he wishes to avail himself of the trade-mark protection in the jurisdiction of the Czechoslovak State. Three copies of the trade-mark, the identity of which should be certified by the chamber of commerce which originally registered it, should be attached to the application, and applicants whose trade-marks were registered with any chamber of commerce in former Austria-Hungary, outside of the territory of the Czechoslovak Republic, should additionally attach a certified abstract from the trade-mark register. The expired period will be deducted from the 10 years' period of protection.

Trade-marks of aliens which had been registered only with the Vienna Chamber of Commerce or only with the Budapest Chamber of Commerce will be protected at their request within the entire jurisdiction of the Czechoslovak Republic with the original priority.

But in the territory where hitherto they have not been in effect they will be subject to the rights of third parties. Trade-marks with the picture or a name of the President

of the Republic or other persons who have been of great service to the State and are generally well known, seals, devices, mottos and coats of arms of States and municipalities or medals, can be registered only if on the basis of present regulations the right to use these special marks has first been established.

A person who has not a fixed residence in the territory of the Czechoslovak Republic can file an application if the laws of his home State extend the same privileges to the subjects of Czechoslovakia, provided also he appoints a duly authorized representative in the Czechoslovak Republic. The period of protection is 10 years. To September 18, 1919, 1720 of new trade-marks and of those already registered in former Austria-Hungary had been presented for recording in the central trade-mark register; 56 of these because of noncompliance with the laws relating to trade-marks had been rejected and 122 had been temporarily withheld.

On substantially the same basis patterns, designs, drawings and representations, showing forms, shapes and the outward appearance of specimens and models of goods and manufactures are protected under the law of July 24, 1919, which confirms otherwise the provisions of the old Austrian law relating to the subject. In this case, however, two samples of the article or its picture along with a certificate of identity shall be presented with the application. Protection is granted for one, two, or at most three years.



Engine Design for Pneumatic Trucks

Editor AUTOMOTIVE INDUSTRIES:

FUELS are not going to improve in volatility but rather will decrease, reaching an end point of 500 deg. F. in 1925. This, we estimate, will be higher than the average offered then but will have to be handled well by the vaporizers if the motors are not to be injured. Therefore, for a given size engine, there must be an allowance made for the loss in weight of charge due heating mixture and, hence, in power. Likewise, an allowance will be made for lower compression possible because of the detonation tendency of higher end point fuels. For a given engine displacement, the loss in power due to all these factors will be at least 10 per cent at medium speeds. Therefore, to maintain power at a given speed, the displacement should be at least 11 per cent greater.

Pneumatic tires for trucks are only a matter of development. They must come, for they solve so many mechanical and transportation problems. Pneumatic tires mean speed of truck and, in order to keep high the ratio of net to gross weight and economy of engine performance by maintaining a high load factor, the engine must be of higher displacement but also must be capable of higher sustained engine speeds. For a given sized truck, it is advisable to use at least 20 per cent higher displacement for pneumatic tires. We, therefore, have an engine of 33 per cent greater displacement for a given capacity of pneumatic tired job with poorer fuel than with solid and good fuel.

We must have greater speed of engine for the purpose of added power to sustain the higher truck speeds on the higher gears. Higher motor speeds will lessen the detonation tendency of lower grade fuels. Higher engine speeds mean lighter engine weights per power developed, a factor that reduces tractive resistance as well as gross weights.

Higher engine speeds demand stiffer crankcase and crankshafts and larger bearings. This is particularly true of the center crankshaft bearing and rod bearings. Class B practice of center and rear bearings alike, with front main and rod bearings alike, admirably meets the problem of increasing speed, as well as attaining a service ideal. High engine speeds make it imperative to have connecting-rod bearings on the piston center. Offset rod bearings have no place on modern engines. This is particularly necessary for smooth running when the engine is old. High engine speeds under load are not detrimental to well-constructed engines, but high speeds with no load are very damaging. We, therefore, plan for a maximum speed governor to hold the idle speed within reason.

Smaller engines can run at higher speeds, due to better cooling, hence the crankshafts should be relatively larger. We have, therefore, made all engines from 289 in. to 492 in. displacement of the same diameter of crank, with all camshaft holes the same as crank, so that service reamers can be used on main rods and camshaft bearings.

High speed in engines demand ample valve capacity,

which need not mean larger valve sizes or excessive lifts. For economy, gas velocities should be such as will assure good turbulence of charge, giving higher velocities.

For highest economy of operation the engine should be so designed as to give a flat economy curve, and special effort should be made to give a good economy for half loads and less. The application should be so worked out that the average speed of truck corresponds to the speed of maximum economy, and when in this position the speed of maximum torque will be about 10 per cent lower. Trucks seldom average over 50 per cent of the governed speed.

High engine speeds demand a water pump of special characteristics. A centrifugal pump which will give ample water at speed is usually unfit for slow truck speeds at high temperatures. If satisfactory for slow speed and high temperatures, it keeps the water temperature too low for economy at high speeds.

There are reasonable limits beyond which it is not practical to go, either in piston speeds or r.p.m. Therefore, some of the increase in truck speed must be provided for in gear ratios.

The difference between some stock engines of old types and new types may be expressed as follows: An old-type engine would not go one-tenth as long at 1800 full load as a new-type engine.

On high-speed engines valve trouble will be greater and some effort at rotation will probably be necessary.

Far better engineering and experimental work will have to be done on the trucks designed for pneumatic work than has been done on solid-tired job. The present practice of letting over-enthusiasm force acceptance of a new model will give way to a persistent effort to attain an ideal in performance.

H. L. HORNING,

Gen. Mgr., Waukesha Motor Co.

Mr. Warner's Terminology

Editor AUTOMOTIVE INDUSTRIES:

I DID not think that anyone would have difficulty in comprehending the terminology of my article in AUTOMOTIVE INDUSTRIES for Jan. 22, as the meanings of all the symbols, in addition to being identical with those invariably used, were either explicitly defined somewhere in the article (in the mathematical appendix in some cases) or appeared to be perfectly clear from the context. However, if there has been any trouble, it might be well to publish the list below.

V= speed of flight

N= r.p.m. of engine

D= propeller diameter

Q= propeller torque

V

— = "slip function"

ND

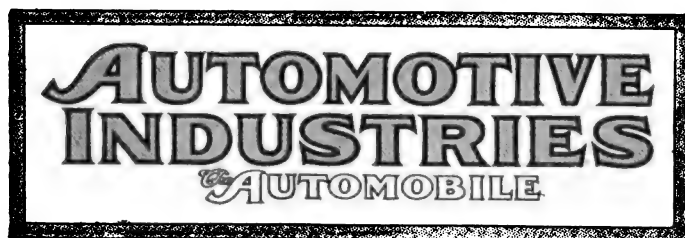
V'

— = "slip function" for best efficiency

ND

P= geometrical pitch of propeller

EDWARD P. WARNER.



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Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907, and The Horseless Age (semi-monthly) May, 1918.

A Blow at Export Trade

THE demand for economy in Government affairs is being heard by Congress, but business men should closely watch this tendency and see to it that this economy move does not go in the wrong direction. One of the latest reports from Washington indicates that Congress is striking at appropriations without a proper knowledge of the use of the money.

The appropriation referred to is that for the maintenance of the foreign trade promotion staff. The amount asked by Secretary Alexander of the Department of Commerce was \$1,658,000, and this was reduced to \$490,000, is the committee recommendation. This would mean the curtailment of the department's activities instead of the expansion that every merchant or manufacturer interested in export trade has been hoping for. In addition to a lessening of the force in the foreign fields, it would bring about the closing of some of the offices maintained in cities in this country through which contact is maintained with firms looking into this trade.

Readers of AUTOMOTIVE INDUSTRIES are familiar with the excellent trade reports supplied by this serv-

ice, and this publication has heard many comments as to the practical helpfulness of the service. The automotive industry is much interested in the development of the export trade and it will need all of the assistance it can obtain. Much of the investigation is expensive and it will be impossible for a single firm to undertake it. The industry should have all the assistance in gathering of data that it is possible for the Government to extend.

Automotive manufacturers and others should communicate at once with members of Congress protesting on the reduction of the appropriation for this necessary investigation. It would be false economy for the Government to limit the export trade by such a move.

Three Speed Tractors

UNTIL the present year it was the general custom to provide farm tractors with two forward speeds, the higher one for plowing under normal conditions, and the lower for plowing in extra hard soil. This year a good many manufacturers have gone to the three-speed gear, making the intermediate speed the direct drive which is normally used for plowing. The top speed is then a geared-up drive and is necessarily somewhat less efficient, but in any work for which the high speed can be used this is of minor consequence, as the draft is not likely to be very heavy. The advantage gained is that it makes the tractor applicable to a large variety of conditions and relatively efficient under all. Its mechanical efficiency will be high under normal operating conditions which prevail most of the time. If the work is of such a nature that high speed is permissible, the tractor is capable of operating at this speed, and if an extra heavy draw bar pull is required, the tractor can deliver this by means of the low or emergency speed.

The tendency toward an increased number of gear changes is general. One tractor shown last year without any change gear this year had a two-speed gear, and the number of tractors with three-speed gears is decidedly greater than last year. When using kerosene as fuel the internal combustion engine is not flexible, and what flexibility is desired in the tractor must be provided in the gear.

Government as a Business

THE business interests of the country should be interested in a bill introduced by Representative Moore of Virginia for a survey of the activities of the U. S. Government to eliminate duplication in activities. If this survey would be made properly, it would be a great relief to business because of the elimination of practically duplicate questionnaires and also by reduction of expenses. It, undoubtedly, is a move in the right direction and, unless the survey becomes as complicated as some other Government activities, it would mean a better Government in every way, as well as a step in the direction of economy.

Getting Back to Sound Business

There has been considerable discussion in the press and among business men as to when the period of reconstruction, following the war activities, would begin. To some persons the failure to note a radical change has been a disappointment; most of us expected some period when we could see or feel that the currents were changing. But that period has not been apparent.

Now it appears that the time is at hand. This indication is noted in the annual report of the Federal Reserve Banking Board and in talks by bankers at meetings of bankers and business men. Notable was one by Frank A. Vanderlip, whose standing as a banker needs no recommendation here. All of these indications agree as to a cause of the present situation and in the suggested remedy. The remedy, it is pointed out, must insure against further speculative inflation and the competition with sound business to which such inflation invariably leads.

The present situation, as agreed by bankers, can be stated by quoting Mr. Vanderlip informally. The act creating the Federal Banking System contained clauses that so changed banking conditions as to permit a member bank to increase its loans to five times the proportion its deposits and reserves as previously allowed. Against this financial freedom, with its lawful limitations, the Federal Reserve Board was given a brake in the form of the privilege of raising the interest rate. This could be used at any time to check the amount of loans.

During the war, when the Government was needing money more rapidly than it could be raised by taxation, the Federal treasury was the greatest borrower, and the Federal Reserve Board saw the need of giving cheap credit to the Government. Naturally, the rate made for the Government had an influence on the rate extended to business firms. The Reserve Board was unwilling to assume the responsibility of extending cheap credits to the Government and high interest credits to business, especially at a time when the Government's activities were so closely allied with those of business.

Now it appears from Treasury Department statements that the need of extensive and cheap borrowing on the part of the Government has diminished and the Reserve Board has practically decided to use the brake power and raise the interest rate to check borrowing for business. The idea behind this move is that cheap credit has created an inflation of business and, even more so, speculation. Men are expanding their factories and other activities more than they would under higher interest credit. Some of this cheap money has been used for speculative factory expansions. The result is business inflation and the spreading thinly of the available labor.

The result of the higher interest rate, as the bankers see it, would be to curb speculative expansion. The added per cent would make the business man planning extensively for the future think twice and carefully analyze his sales prospects, not only for the few months after his new factory would be completed, but for a more extended period. The result would be a readjustment to a conservative or normal basis of planning business.

The bankers admit freely that this change is going to cause embarrassment to some persons and firms. Plans will have to be changed somewhat. Some sites bought for new factories will not be used at once. Production in existing plants will have to be intensified rather than spread through new buildings. If these new buildings were constructed and equipped they probably would be undermanned for some time to come because the labor does not seem to be available for the present working facilities.

The bankers are asking the men and firms who may be embarrassed to accommodate themselves to circumstances and to console themselves with the thought that they probably will be in better shape to meet future conditions than if the present inflation was permitted to continue to grow until the gas bag burst and all business dropped with a dull thud.

Bankers, of course, are not infallible as prophets, but they are the best material we have for looking into the financial future, and business should listen to them. We must admit, at least, that the bankers are sincere in their efforts to draw the curtain from the future and, as they hold control of the money vaults, it will be better to meet them gracefully than to be violent about something that business cannot help.

Mercer—Locomobile—Simplex Under Hare's Motors Control

Central Organization Will Direct Operating Functions of Three Companies Which Will Remain Separate Entities—Plans Development of New Models

NEW YORK, Feb. 27—Emlen S. Hare has announced the formation of Hare's Motors, an operating company to control jointly the Locomobile, the Mercer and the Simplex companies.

Immediate increase in the output of the present factories will be one of the results of the plan of joint control, and the addition and development of more transportation units, passenger and truck, will follow.

In this new venture, the former vice-president of the Packard Motor Car Co. of Detroit and the Packard Motor Car Co. of New York has adopted the keynote of "quality with quantity production" and has promised the creation of a line of non-competitive cars and commercial vehicles to meet the various transportation demands.

To accomplish this ideal he has surrounded himself with men with established reputations in the design, production and merchandising of quality cars and trucks. H. D. Church, formerly chief engineer of the Packard truck division, is vice-president of Hare's Motors in charge of engineering development. Working with him as vice-president and consulting engineer is A. L. Riker, formerly vice-president and chief engineer of the Locomobile Company of America. O. E. Hunt, formerly chief engineer of the motor division, Packard Motor Car Co., enters the company as vice-president in charge of production and also as vice-president of the Locomobile, Mercer and Simplex companies. In charge of distribution and maintenance is Henry Lansdale, formerly general carriage sales manager of the Packard company.

Department Heads Named

Flanking these leaders in the creation of his operating organization Hare has F. Van Z. Lane, former general transportation engineer of the Packard company, as general maintenance manager; E. A. Travis, formerly general sales manager of the Locomobile company, as general distribution manager; J. A. Kingman, formerly general advertising manager of the Locomobile company, as general advertising manager, and W. A. Smith and P. W. Hine, of the Mercer and Locomobile sales departments, as distribution managers of their respective divisions. E. J. Ross, formerly manager of the Government division, The Locomobile Company of America, is export manager.

With this nucleus established and backed by the facilities of the Locomobile and Mercer factories, and with sufficient financial backing pledged to en-

sure the successful launching of the venture, Hare has set an objective of \$200,000,000 business a year after five years.

He has given definite assurance that the present models of both the Locomobile and Mercer will be continued, and in addition to this that a "little" Locomobile to sell in the vicinity of \$2,000, will be put in production next year. The development of the truck line will come later and will provide a complete range. The object of the creation of the "little" Locomobile is to supply the demand for a moderate priced car of the highest quality compatible with price, that will fill out the line of non-competitive units and sell in quantities sufficient to insure, with the Mercer, a sufficient income to the dealers handling the entire line.

Would Make 20,000 a Year

Hare points out that by applying quantity methods in the production of these quality cars, it should be possible to manufacture and merchandise 20,000 cars a year at about \$7,000, 50,000 a year at \$4,000 and a great many at \$2,000. But no reduction in the price of Locomobile and Mercer cars is promised in the next year, because of the material situation which now demands long-period contracts at prevailing prices.

Although no immediate changes are contemplated in the construction of the merchandising organization of Hare's Motors, President Hare said, in answer to questions, that it was desirable that the full line of cars and trucks eventually be handled by single distributors and dealers in their respective territories.

In presenting Hare's Motors to a representative gathering at a luncheon in the Hotel Claridge, Hare said:

"Hare's Motors has been organized not merely to centralize control and to direct production and distribution of the factories thus brought together. This action is simply the first step in a new plan as it involves an interesting quality-quantity conception; and its scope will be wide, embracing the entire passenger car and truck field."

He summarized the broad general program of the enterprise in these words:

"Briefly, our organization is dedicated to a new principle of building. The purpose is to supply automotive passenger and freight transportation of the highest quality, to make this sort of transportation available to the greatest possible number of users through quantity engineering, production, distribution and maintenance methods."

The Locomobile, Mercer and Simplex companies will retain their respective identities as individual corporations. The Locomobile and Mercer plants will operate solely as manufacturing establishments in that the departments of engineering, distribution, maintenance and advertising will be removed and operated as departments of Hare's Motors.

All matters of general administration, engineering development, major finance, etc., will be handled by Hare's Motors with executive offices at 16 West 61st Street, New York City.

The present organization was effected through the following steps:

Last October Mercer Motors Co. acquired the property of the Mercer Automobile Co.

In December the Locomobile Co. was organized to take over the property of the Locomobile Company of America, Mercer Motors receiving at that time a substantial interest in the Locomobile Co.

In January the Mercer Motors Co. absorbed the Simplex Automobile Co., manufacturer of the Simplex and the Crane-Simplex cars.

Hare's Motors was then organized, owned jointly by the Locomobile Co. and the Mercer Motors Co. Now Hare's Motors takes charge of the Locomobile Co., Mercer Motors and Simplex companies.

French Want Tractor Subsidy Continued

PARIS, Feb. 4 (*Special Correspondence*)—The French Government subsidy given on the purchase of an agricultural tractor has been abolished when the machine is of foreign origin, and has been reduced to 25 per cent of purchase price when machine is of French construction.

This measure has created discontent among farmers, many of whom had purchased tractors on the promise of the Government that a subsidy would be granted. A protest has been sent to the Agricultural Department of the French Government by one of the leading French automobile clubs. In this protest it is pointed out that agricultural tractors have been adopted owing to the shortage of labor, and any measure which discourages their use will result in a shortage of wheat.

On an average an agricultural tractor in France ploughs 250 acres of land a year, this producing on a minimum 80 tons of wheat. In order to meet the present deficit the French Government is obliged to purchase wheat abroad, and loses on this operation \$114 for every 1000 lb. of wheat purchased. Every agricultural tractor in service in France economizes the State's funds to the extent of \$8,000, and as the subsidy which has been given in the past never exceeds \$2,000 and in many cases is less than \$1,000, there is a net saving to the Government of \$6,000 for each tractor put into service. French farmers insist on the maintenance of the tractors subsidy and protest against any difference being made between tractors of foreign and French construction.

Many New Airplanes For New York Show

Remarkable Development of Air
Transportation Industry to
Be Exhibited March 6-13

NEW YORK, March 2—An excellent exposition of airplane engines, model landing field, factory testing devices and airplane equipment is promised at the Second Annual Exposition of the Manufacturers' Aircraft Association, which will be held in the 71st Regiment Armory at 34th Street and Park Avenue, New York, March 6 to 13. It is purely an American show and indicative of our progress in air transportation. Twenty types of aircraft will be shown by leading manufacturers. These range from tiny monoplanes weighing less than 500 lbs., built to carry but one person, to the huge air mail planes of ten tons weight and capable of carrying three tons of useful load. Among the other exhibits will be the two, three and ten passenger seaplanes for sport use and air touring. Several new flying-boats of startling design are to make their maiden bow.

Among the accessories that will attract particular attention is the radio directional device, several types of which are to be shown.

A distinctly new type of aircraft, a sporting dirigible, will be exhibited. The new craft is a Goodyear Pony Blimp designed after the lines of the huge blimps that are of great service for naval observation. It is designed to meet the desires of balloonists for a lighter-than-air ship with an adequate cruising radius and ceiling. The useful lift is 800 lb., though on trials the pony blimp has carried 935 lbs., including passengers, ballast, anchors, drag ropes, parachute and fuel. It is 95 ft. long, 38 ft. high and 28 ft. in diameter, motored with a 4-cylinder 16 valve, 40 hp. Ace engine mounted as a pusher. The pony blimp showed a trial speed of 40 miles an hour. It has a range of about 400 miles or ten hours of cruising speed.

Curtiss to Show Wind Tunnel

Another interesting exhibit will be the model wind tunnel shown by the Curtiss Aeroplane and Motor Corp. The new tunnel is in three sections—the collector into which the air stream flows, experimental chamber in which the tests are made and the diffuser through which the air stream leaves the tunnel.

The Aeromarine Plane and Motor Co. of Keyport, N. J., will exhibit one of its new model 50 "B-2" flying limousines. It has a hooded cabin in which both pilot and passenger are shielded from the wind. The interior is finished in blue leather upholstery. A powerful 150 hp. aeromarine motor enables the air-limousine to maintain a speed of 75 m.p.h. for three and one-half hours in the air. This flying boat weighs 3100 lb. and carries a useful load of 820 lb.

The Dayton-Wright division of the General Motors Corp. will show a Dayton-Wright cabin cruising model K-D,

a purely commercial airplane built for passenger carrying or freight. It is powered with a Liberty 12, giving a maximum speed of 120 m.p.h. and weighing 2685 lbs. empty. The seating arrangement affords comfortable quarters.

Orville Wright will show a model O-W air coupe, equipped with a Hispano-Suiza motor. There is room for three passengers to sit comfortably in the upholstered chairs. The coupe weighs 2492 lbs. and carries a useful load of 1042 lbs.

The Owl, designed and built by the L. W. F. Engineering Co. of College Point, L. I., is the largest entry of the Aircraft Exposition. It is announced as the world's largest air freighter. The Owl is a land machine of 1200 hp., capable of supporting a load of 20,000 lb.

Ford Advances Prices on Cars and Trucks

DETROIT, March 4—New Ford prices, effective to-day, show an increase of \$50 on open models and \$100 on inclosed models and Fordson tractors. Truck prices advance \$50.

The inclosed models now sell at \$850 for the coupe and \$975 for the sedan. That includes full equipment. Heretofore the price was \$200 less, with demountable rims and electrical equipment costing \$100 extra.

The Ford Motor Co., with a schedule of 1,000,000 cars in 1920, closed the first seven months of the fiscal year, Feb. 28, with a record of 567,372 cars. Despite the freight congestion and trouble in getting parts, Ford production for March, April, May, June and July is fixed at 100,000 cars each month. At the present rate the output will exceed the contemplated production by 250,000 cars for the fiscal year.

Despite this large output, Ford's unfilled orders on Feb. 10 were 23,492 cars.

In addition to the passenger car program Ford plans to build 150,000 trucks during 1920. The plant turned out 12,000 trucks in February.

Willys to Increase Stock to \$125,000,000

TOLEDO, OHIO, Feb. 27—Willys-Overland stockholders will meet March 24 to vote on a proposed increase in the capital stock from \$75,000,000 to \$125,000,000. The additional stock, consisting of \$25,000,000 of junior preferred and \$25,000,000 of common is to be issued at the discretion of directors.

Earnings of the company for the present quarter will reach \$3,500,000, which, according to Willys, will increase during the year, making an annual profit conservatively estimated at \$16,000,000. According to Willys the company's inventory shows \$40,000,000 invested in raw material.

Metric System Is Opposed in England

Motor Trades Involved in Gen-
eral Division Over Question
—Catalogs Use Both

LONDON, Feb. 13—(*Special correspondence*)—Although there is a certain amount of favor toward the metric system in Great Britain, it is not as large as might be inferred from the inspired literature circulated by reformers. The motor trade probably is as divided on this matter as any section of the engineering trade, the drafting offices and the factories using metric figuration, while the repairshops and public favor the inch scale. The public as users of motor vehicles find the rift curiously reflected in the makers' catalogs and lists. It is very common to list the bore and stroke in inches and decimals, but tires are almost always in millimetres. American catalogs are showing the same trend, whereas formerly they invariably used the inch scale.

A vigorous program is being pushed here by the metric enthusiasts, and recently a State committee was appointed to deal with the problem. This body is due to issue its report, and it is believed that it will be unfavorable to the change advocated by these reformers.

A recent remark of the president of the Board of Trade lends support to this view. He made his remarks to a deputation of the Trades Union Congress in answer to a question; the trades, it is understood in general, being opposed to the change. The president of the Board of Trade said there were certain advantages in the system, and there were great disadvantages in the process of introduction. He said:

"More than half of the export trade of this country was with countries that did not use the metric system and did not intend to adopt it. In the textile trades the largest and most extensively used was the British system which so many people condemned. Supposing that it was decided to pass from the yard to the metre, it would mean the replacement of practically the whole mass of textile machinery. That could not be done in a day, and it could not be done in twenty years, and during the period of change the difficulty of running the two types of machines would be great.

"The consequent dislocation of the trade which would result would be enormous. Nobody was prevented from using the metric system, and it had been left to the process of natural selection, which was usually more effective than anything which might be preconceived."

ENGLISHMAN.

AIR SCHOOLS PLANNED

WASHINGTON, Feb. 27—Fifteen special Air Service schools will be established at the various flying fields by the Air Service following authority for the establishment of these schools granted by Secretary of War Newton D. Baker.

Schroeder Uses New Equipment in Climb

Moss Supercharger and Aniline Fuel Constituents Make New Altitudes Possible

DAYTON, March 1—Major Schroeder's altitude record of 36,020 ft. on Feb. 27 here was made possible by the combined use of the Moss supercharger and a special fuel constituent developed by the C. F. Kettering laboratory. The supercharger was originated by the General Electrical Co., being the design of Dr. Sanford A. Moss. The engineering department of McCook Field is responsible for its perfection. The fuel component is a special compound of the aniline series and is added to the gasoline. Its purpose is to remove the tendency to detonate and to permit of the high compression ratios provided by the supercharger.

Major Schroeder, who is now recuperating from his narrow escape in the recent flight, states that his machine was functioning perfectly when he reached his maximum altitude.

Ordinarily an airplane loses about 50 per cent of its power at 18,000 ft., due to lack of oxygen. With the supercharger the Liberty engine developed practically its full horsepower at the high altitude and only lost climbing speed because of the atmospheric pressure drop.

The plane fell into a tail-spin when its operator lost consciousness, due to failure of his oxygen supply.

This mishap occurred when the plane was otherwise in perfect condition to have reached 40,000 ft., which is the mark at which Major Schroeder aimed. Not only did Major Schroeder lose consciousness, due to lack of oxygen, but his sight was temporarily destroyed because of the freezing of his eyeballs, due to removing his goggles in attempting to adjust the oxygen supply. The instruments on the machine registered 67 deg. below zero.

Major Schroeder regained consciousness for a brief lapse of time just above the field and almost by instinct and practically blind he managed to make a landing before again losing consciousness. He is at present recuperating and states that he intends to make another attempt. The machine is at present being rebuilt.

La Pere Plane Used

Government censorship draws a veil over certain details of the machine, but it is known that the plane was the standard Le Pere type built at the Packard factory and equipped with the same ignition system as in wartime types. The pilot was literally wrapped in electrically heated clothing and in addition wore a suit lined with heavy fur.

He was equipped with an oxygen mask of his own design, connected to the main auxiliary tanks. The supply at the main tank failed and he had only the auxiliary supply to draw on, which caused the shortage.

An interesting feature of the descent, in which the plane fell more than five miles in about two minutes, is the fact

that the change in pressure from 3 to 15 lb. a square inch crushed the gasoline tanks and caused a serious dilation of the pilot's heart.

Army engineers here who have inspected the plane say that nothing but the failure of Major Schroeder's oxygen supply could have prevented his topping the 40,000-ft. mark, and they know the major and the machine well enough to express their confidence in the success of his next trip.

Gasoline Economy Campaign Planned

NEW YORK, March 2—The National Automobile Chamber of Commerce, in conjunction with the National Automobile Dealers' Association and other organizations, is planning a gasoline economy campaign.

Data on this subject will be incorporated in the instruction books of all manufacturers and the idea will be advanced to the dealers of the country that they advertise and recommend the adjustment of carbureters. It is suggested that a flat rate for this service be made in order to encourage motor vehicle owners to have the adjustments made as a means of checking gasoline consumption.

An appeal also will be made to truck drivers not to run their engines continually. At present, due to the fact that trucks are not equipped with starters, the drivers generally leave the engines running during delivery stops.

This step by the national associations is to be made as a result of the present upward trend of crude oil prices which is bringing with it advanced gasoline prices. That gasoline prices must go higher, in view of the present conditions in the crude oil field, is the opinion of experts in the Bureau of Mines, with whom Al Reeves, of the N. A. C. C., conferred recently in Washington.

LaFayette Production to Be Started in May

INDIANAPOLIS, March 1—LaFayette Motors Co. will start production in May and deliveries in June, in line with its schedule.

All fear of a delay in production has been dissipated by the rapid acquisition of a force of skilled mechanics and automobile workers, many of whom left other automobile plants voluntarily, in order to hook up with the LaFayette organization. Many of them have had valuable experience in airplane engine shops, government aviation camps and French flying fields.

ARMY TOOLS FOR SCHOOLS

WASHINGTON, Feb. 24.—The transfer of machine tools, machinery and other supplies from the War Department to the Federal Board of Vocational Education is authorized by a bill introduced into the House by Congressman Treadway. These supplies and tools would be used to educate and rehabilitate discharged soldiers, sailors and marines.

Duesenberg First in Los Angeles Race

Goes 250 Miles on New Mile and a Quarter Track Without Stop in 2.23.18

LOS ANGELES, Feb. 29—Fifty-five thousand spectators witnessed the opening championship event at the new board speedway at Beverly Hills this week. No new records were created, but in the excellent time and many exciting spurts of the contestants the spectators found ample thrills. Two postponements and a day of threatening storms had no effect on the ardor of the crowd.

The speedway track is a mile and a quarter and the entire plant represents an outlay of almost \$1,000,000. There will be but two championship races a year, so it can be seen enormous crowds will have to attend to put the proposition over. The automobile dealers closed their doors and made a holiday of the event.

"Jimmy" Murphy, in a Duesenberg, drove a non-stop race for 250 miles and won easily. He averaged 103 m.p.h. Ten prizes were offered, totaling \$25,000, but only nine of the 18 cars that started were able to finish. Those that participated in the money were driven by Murphy, Thomas, Vail, Sables, O'Donnell, Hearne, Mulford, R. DePalma, J. DePalma, finishing in the order named. Those eliminated were Boyer, Klein, Goodson, Pullen, Stein, Hill, Durant, Dutton, Millon. Broken connecting rods were the chief cause for elimination.

In addition to being the opening event in the new speedway, and for the year, this was the first of the championship races. Each of the nine drivers who finished was awarded points that will be included in determining the championship driver for 1920. The race was run under the supervision of the A. A. A., and prominent officials of that body attended. It was free from an accident of any kind, the nearest approach being when a wheel broke on Klein's car while making 104 m.p.h. on one of the turns. His car happened to be in the clear at the time and slid down into the safety zone without overturning.

NEW ZEALAND CHANGES DUTY

WASHINGTON, Feb. 28—The Government of New Zealand has placed a flat duty of 20 per cent on all motor cars without regard to the country of origin, according to a report received by the Bureau of Foreign and Domestic Commerce from Trade Commissioner Melbourne. Formerly the chassis came in free of duty from the United Kingdom, and the British Empire, and was subject to a duty of 10 per cent ad valorem from other countries, while bodies were dutiable at 20 per cent ad valorem. The duty is now 20 per cent on the car as a whole, but separate chassis continue to be admitted free from the United Kingdom and at the rate of 10 per cent from other countries.

Automotive Exports for December

COUNTRIES	TRUCKS		CARS		PARTS Dollars	TIRES Dollars	GAS ENGINES	
	Number	Dollars	Number	Dollars			Number	Dollars
Austria-Hungary					790	10,800		
Belgium	6	7,559	142	170,400	2,217	84,467	47	40,150
Bulgaria			1	3,220	307			
Denmark	38	62,870	95	144,509	10,614	189,939	3	2,733
Finland					15			
France	68	326,243	62	96,779	516,526	205,635	280	229,607
Greece			34	53,103	4,082	28,129		
Iceland and Faroe Islands	1	300	6	4,450	2,219	701	1	1,350
Italy	1	1,700	9	28,475	6,671	82,528	1	900
Malta, Gozo, and Cyprus Islands			12	5,851	24			
Netherlands	30	53,547	258	267,824	15,753	186,139		
Norway	14	30,723	46	52,553	56,991	71,323		
Portugal	7	17,034	30	36,772	2,640	19,214	3	4,596
Roumania	1	2,178	8	20,333	378	23,972	8	10,542
Russia in Europe	1	503	15	7,246		1,250	7	9,000
Spain	78	154,065	271	297,737	41,207	118,981	57	60,406
Sweden	4	8,243	30	44,969	799	54,628		
Switzerland	6	9,527	168	205,224	989	81,461	18	14,336
Turkey in Europe					200	32		
England	391	552,136	848	986,317	1,025,618	340,998	87	68,216
Scotland			5	3,694	1,588	65	1	600
Ireland	1	867	215	209,831	250		88	49,360
British Honduras					505	400		
Canada	128	215,969	445	644,765	1,661,269	67,412	227	203,182
Costa Rica			2	3,369	1,901	1,715	2	2,881
Guatemala	1	1,414	3	5,300	1,257			
Honduras			11	6,841	2,251	1,787		
Nicaragua	2	5,640	12	15,407	1,525	2,810		
Panama	1	700	15	16,475	3,501	24,589	2	2,307
Salvador	4	8,897	6	9,008	2,564	4,794		
Mexico	98	108,248	277	260,671	68,151	71,369	22	47,373
Newfoundland and Labrador			6	9,585	1,405	3,316		
Barbados			10	5,040	82	647		
Jamaica	2	4,800	18	25,078	12,298	13,825	4	3,876
Trinidad and Tobago	6	12,654	21	15,505	15,772	14,841		
Other British West Indies			4	1,950	1,858	1,031		
Cuba	109	259,031	499	481,723	118,005	202,254	26	55,336
Danish West Indies			1	1,250	286	963		
Dutch West Indies			2	966	817	217		
French West Indies	1	1,414	1	290	2,796	2,138		
Haiti			6	4,932	2,056	8,073		
Dominican Republic	1	3,000	7	10,616	3,429	4,225	1	1,300
Argentina	3	3,651	294	307,882	518,019	41,266	113	72,979
Bolivia	2	4,500	4	5,000	128	2,250	1	1,800
Brazil	54	37,394	235	216,891	115,407	121,452	1	325
Chile	3	3,993	11	28,261	38,169	22,529	10	13,041
Colombia	3	7,375	46	72,596	13,036	14,223		
Ecuador					1,403	400		
British Guiana	2	1,500	2	1,462	4,156	1,462		
Dutch Guiana					134	100		
Paraguay			1	500				
Peru	57	33,463	62	53,209	17,116	17,756	19	10,640
Uruguay	1	3,280	182	174,993	7,690	26,536	14	9,650
Venezuela			10	16,546	8,399	5,823		
Aden					2,630			
China	5	8,316	76	60,109	6,260	1,113		
Chosen					2,054	145		
British India	71	163,210	548	582,822	91,191	93,850	22	11,917
Straits Settlements	2	3,832	50	60,701	6,250	75,387		
Other British East Indies	2	4,166	9	15,592	2,426	1,909	8	5,200
Dutch East Indies	21	50,651	123	181,981	13,326	27,150		
French East Indies					291			
Hongkong			8	8,639	861	738		
Japan	45	38,715	147	132,714	29,488	4,353	3	6,785
Persia			1	575				
Russia in Asia	7	20,565			3,025			
Siam					789			
Turkey in Asia			44	43,551	47	156	1	440
Australia	115	137,645	590	605,711	234,684	81,663	4	950
New Zealand	23	57,205	476	542,507	90,365	82,448	42	51,024
Other British Oceania	4	4,163	3	2,040	300			
French Oceania					693	813		
German Oceania					300	1,029		
Philippine Islands	9	15,815	127	149,506	28,234	79,968	224	76,591
Belgian Congo	1	1,396					1	3,417
British West Africa	25	40,321	52	56,266	15,774	6,592		
British South Africa	1	1,100	329	355,409	122,479	68,797	64	44,149
British East Africa			20	22,937	4,246	1,080	4	6,885
Canary Islands					91	576		
French Africa	3	1,511	57	43,132	9,611	8,325	178	154,530
German Africa	6	2,651	6	2,960	942			
Morocco			36	42,715	11,538		20	10,224
Portuguese Africa			4	4,765		150		
Egypt			60	55,163	3,430	441	2	3,298
Total	1465	2,495,685	7213	8,012,973	4,996,638			

SHIPMENTS TO NON-CONTIGUOUS TERRITORY

Alaska	1	1,000	1	70	2,133		
Hawaii	51	80,768	420	493,165	61,874	169,075	
Porto Rico	17	54,396	57	81,739	35,969	51,840	

Belgium Holds First Automotive Exhibit

British Lead in Motorcycle Show — New Brevets Spring Cycle Described

BRUSSELS, Feb 14—(*Special Correspondence*)—The Belgians' first show connected with the automotive industries is now being held in the Egmont Palace and is devoted to motorcycles and accessories. Foreign firms are in the immense majority, English makers being the most numerous, followed by Americans and Italians.

Belgian firms are devoting attention to the construction of motorcycles, as is shown by the appearance of two new concerns. The F. N. Company, which is the biggest motorcycle concern in Belgium, does not exhibit, although it is the intention of this company to turn out 15,000 motorcycles in 1920. The firm will build two models, a single and a four-cylinder, both of them with shaft drive. These are on the same general lines as before the war, but modified in detail.

Sarolea is in production on a single-cylinder 3½-hp. machine. Gillet is a new firm, controlled by engineers who were formerly with the F. N. They have produced a single cylinder two-stroke, the feature of which is the embodiment of a two-speed gear in the crankcase. This is ahead of the cylinder and gives a long belt drive to the rear wheel. The same firm also has in preparation a twin cylinder four-cycle machine with the same general type of change speed gear in the engine crankcase. For this construction the crankshaft is carried in ball bearings; roller bearings are used for the connecting rods, and shaft and rods are of BND alloy steel.

Brevets Cycle Is Show Feature

The machine which attracted most attention at the show was a new one built at Liege under the designation Brevets Spring. It is declared that the rights to build this have been secured by one of the most important motorcycle firms in England. The feature of this machine is the unit power plant on automobile lines. This comprises a twin cylinder air cooled V engine of 65 by 75 mm. bore and stroke, a disc clutch, three sliding gears, and bevel drive to a cross shaft. From this latter, power is transmitted to the rear wheel by means of a chain.

The crankcase comprises four separate castings. The lower portion is a single piece resting on and bolted to the cradle frame. It carries all the bearings and is intended to remain in position in the frame. On this lower base chamber is mounted the upper half of the engine crankcase, carrying the cylinders; a separate timing gear housing; and an independent aluminum housing covering the clutch and the gears. The clutch and gears can be completely exposed without taking the power plant out of the frame, by removing a few readily accessible bolts and disconnecting the

magneto. The cylinders can be taken off while the power plant is in position in the frame. The timing gear housing is removable without touching any other organ. Undoubtedly this is the most readily accessible motorcycle power plant ever put on the European market.

The Brevets Spring machine has been designed to be equipped with electric lighting. The electric generator, which will be positively driven, will be placed on the top of the gearbox housing and will be removed with this latter without having to break any connections. The storage battery will be carried just back of the main cradle frame.

Design Insures Stability

With the cylinders placed across the machine instead of fore and aft, the first draft of air comes on the valves and valve stems. There is a lateral frame on each side of the main frame carrying runningboards and leg guards. These latter are fitted with louvers for the passage of air and have opening for the passage of the exhaust pipe. The arrangement gives an independent pipe and an independent cut-out for each cylinder.

With this design the center of gravity is far forward. It is claimed, however, that with a rider on the saddle perfect weight distribution is obtained and that the stability of the machine is very much greater than on the usual types of machines with the greater proportion of the weight on the rear. The wheelbase is 59 in. The rear wheel is demountable on removing one bolt without disturbing the chain, sprocket or brake mechanism, thus enormously facilitating tire changing.

The saddle is carried on a frame consisting of a pair of semi-elliptic leaf springs. The rear mudguard and baggage carrier is a one-piece steel stamping with two tool boxes. Only the hinges of the doors are riveted to this. The whole is removable by detaching three winged nuts.

F W D Takes Over Menominee Truck

MILWAUKEE, March 1—Stockholders in the F W D Automobile Co. of Clintonville, Wis., who recently acquired the principal interest in the Menominee Motor Truck Co. of Menominee, Mich., have taken over the entire ownership. For the present the F W D plant will be used, but later new buildings will be erected to accommodate the operation.

The Menominee truck will be continued in its present form, rounding out the F W D company's line of four-wheel-drive commercial cars and enabling it to offer through its present broad distributing organization a full line of trucks to suit any requirement.

A \$500,000 corporation has been organized in Wisconsin to take over the Menominee Motor Truck Co., a Michigan corporation. The present name will be retained, but the concern will be officered by present officers and directors of the F W D company.

To Continue Trial of Schrader Firm

Supreme Court Denies Demurrer in Trust Charges Against Manufacturer

WASHINGTON, March 2—The case of A. Schrader's Sons, Inc., charged with the violation of the Sherman Anti-Trust Act, was referred back to the Northern District Court of Ohio yesterday by the Supreme Court of the United States for further action.

The Schraders had been defendants in the Northern District Court on charges by the Government that they had violated the Sherman act in requiring tire manufacturers and jobbers to whom they sold their products "to execute uniform contracts concerning resales," and with "refusing to sell those who did not enter into such contracts and adhere to the uniform resale prices fixed."

The Supreme Court failed to sustain the demurrer granted by the Ohio district court, in which that court found that the Schraders had not entered into licensed agreements, but rather into selling agreements, and compared the Schrader company's case with the one in which Colgate & Co. were involved, where the Supreme Court found it was not a violation for manufacturers to inform their customers of their desire for price maintenance.

In the Schrader case the Supreme Court found there was no comparison with the case of Colgate & Co. It declared that there is a distinct difference between the manufacturer who displays a desire for price maintenance by request and one who maintains prices by obligatory agreements.

This action by the Supreme Court does not mean that it has found the Schraders guilty of violating the Sherman act, but merely that the demurrer based on a claim by the company was not allowed.

The Supreme Court, having passed on the interpretation of its Colgate decision, sends the Schrader case back to the Ohio court for completion.

SPIRO TAKES NEW PLANT

INDIANAPOLIS, March 2—The C. Spiro Manufacturing Co. of New York, makers of runningboards, robe and foot rails and other automobile equipment, will locate a branch factory in Indianapolis. A lease has been taken on the former Diamond Chain factory and operations are expected to begin April 1. George Spiro will be manager of the Indianapolis plant.

FRANKLIN OUTPUT, 16,000

ROCHESTER, N. Y., March 2—Production of Franklin cars in 1920 has been set by officials of the company at 16,000, an increase of 80 per cent over the output of 1919. The company is offering an additional \$1,000,000 of its 7 per cent cumulative preferred sinking fund stock at \$100 a share and accrued dividends.

Motor Wheel Plans \$12,000,000 Business

Merged Companies Begin Operations Under New Control—
Stock Offered at Par

LANSING, MICH., Feb. 28—Ratification of the merger plans for the Motor Wheel Corp., has been completed and the new corporation, capitalized at \$11,000,000, began operations this week. The merger included the Prudden Wheel Co., the Auto Wheel Co., the Gier Pressed Steel Co., and Weis & Lesh Manufacturing Co., of Memphis, Tenn. A price of \$25 bid and \$26 asked has been fixed to start trading in the new stock, which will be traded in on the curbs until it gets an official rating on the exchanges.

In the reissuance of stock Prudden Wheel is taken as a "bogie" at \$22.728 a share and stockholders of other companies receive shares in the new company in proportion to the book value of their holdings divided by the "bogie," Prudden stockholders getting share for share, Gier, with a book value of \$24.271, is exchanged on a 106.78 per cent basis. Auto Wheel, with a book value of \$18.028, on a 79.32 basis. Stockholders of Prudden Wheel will be allowed to buy the company's interest in Weis & Lesh at \$23, the price paid originally, and also will be allotted the subscription privilege of $7\frac{1}{2}$ shares of Weis & Lesh. The latter stock is exchangeable on a basis of two for one, the book value being \$43.37.

Fractional shares in the new company will not be issued, holders of less than one share being paid at the rate of \$22.728 a share. Holders of a majority fraction have the option of purchasing a full share at the rate of \$22.72.

Permanent Officers Named

Officers of the new corporation are William Newbrough, chairman of the board; Harry Harper, president; B. S. Gier, vice-president and treasurer; Drury L. Porter, vice-president; W. C. Brock, vice-president, and Clarence Carlton, secretary. The officers, with O. A. Jenison, Charles Nichols and Benjamin Seigfried, constitute the board. The National City Co., a subsidiary of the National City Bank, is behind the deal and will take part of the preferred stock.

Of the capitalization \$6,000,000 will be common and \$5,000,000 preferred. Transfer of stock of constituent companies will require \$3,001,084 of common stock leaving a surplus of \$3,000,000 unissued.

The combined balance sheet shows assets of the four companies \$8,881,027.18. A portion of the preferred stock will be sold to give ample working capital and clean up all outstanding obligations. The preferred probably will be 8 per cent and a sinking fund will be created to retire the issue. Common stock will be put on a quarterly dividend basis.

The three local concerns occupy virtually contiguous ground and the con-

solidation will prove of great benefit from a manufacturing standpoint. Auto Wheel will be equipped to make truck wheels and the lighter machinery placed in the Prudden factory for the manufacture of passenger car wheels. The Gier Co. is in position to handle the corporation's entrance into the steel wheel field and will be a feeder of various steel parts entering into wheel making. Weis & Lesh owns 25,000,000 ft. of timber five country mills and two spoke turning plants, with its own railroads into the supply fields.

Plan \$12,000,000 Business

The combined sales of the four companies for 10 months in 1919 up to the period of their annual statements, of \$7,996,111.93 is an indication of the scope of their business. Inter-company sales in the same period aggregated \$639,637.38. Gross profits for the period were \$1,172,043.97 and federal taxes, \$329,273.23. Unfilled orders up to last Saturday were \$4,602,752.98, and contracts extend only to June 30, the companies making it a practice to insist on short time contracts with renewal on new price schedules on account of the market fluctuations. The first year's business of the new corporation is expected to approximate \$12,000,000.

Net assets of each company are: Prudden, \$3,408,701.62; Gier, \$1,896,180.12; Auto Wheel, \$648,179.47; Weis & Lesh, \$867,449.13. Each company's per cent of the total assets and shares in the corporation are: Prudden, 49.9776; Gier, 27.8009; Auto Wheel, 9.5033; Weis & Lesh, 12.7182.

Land, buildings and equipment of the merged companies are valued at \$4,603,191.18, investments, \$143,313.88, and current assets, \$4,054,222.93. Current liabilities are \$1,865,456.84 with stock issues and surplus of \$7,015,570.34. An item of \$239,280.33, for Weis & Lesh "good will" is not included in the figures.

NEW PEERLESS PRICES

NEW YORK, Feb. 27—Increases in price of \$150 on open models and \$200 on inclosed cars is announced by the Peerless Motor Car Co. of Cleveland.

The increases are as follows:

	1920	1919
7-Passenger touring car.....	\$3,050	\$2,900
4-Passenger roadster.....	3,050	2,900
4-Passenger coupe.....	3,700	3,500
7-Passenger sedan.....	3,900	3,700

KISSEL OPENS SHOWROOM

HARTFORD, WIS., March 1—The Kissel Motor Car Co. of Hartford, Wis., is rebuilding the west end of its two-story main factory building into a new administration building, consolidating all executive departments, and providing on the second floor a palatial showroom for the display of a complete line of its passenger and commercial cars, parts, etc., for the benefit of distributors, dealers and other visitors to the plant. The space formerly was used by the upholstering shop, but during the war was turned over for extra office space and to quarter army officers on duty at the Kissel works.

Want Commercial Attaches Retained

N.A.C.C. to Ask Congress to Restore Appropriation for Business Representatives Abroad

NEW YORK, March 2—Business interests of the United States, including the automobile industry, are condemning as "false economy" the recent action of the Appropriations Committee of the House of Representatives in cutting \$1,000,000 from the appropriation for the work of the Foreign and Domestic Commerce Department. A special committee of the National Trade Council will go to Washington next week to urge the retention of many features of the appropriation measure in which they are interested.

One of the acts of the appropriations committee which has met with particular opposition from the N. A. C. C., representing the automobile makers, is the cutting off of the commercial attaches in foreign countries. The plan under this arrangement is that all of this commercial work be done by the diplomatic representatives of the State Department.

The automobile industry contends that the matter cannot be handled on a satisfactory basis in this way, because the diplomatic representatives have to stay most of the time in one place, whereas the commercial attaches can move around and conduct commercial investigations which are of great value to the businessmen of the United States. This contention is pressed, also, by representatives of other American industries.

Al Reeves, general manager of the N. A. C. C., has characterized as "pink tea" business methods the plan for delegating to the diplomatic representatives the work formerly undertaken by commercial attaches. He points out that the N. A. C. C. is strongly for economy, but he and the people he represents believe that this move is false economy, and they are prepared to fight it vigorously.

Would Expand Foreign Trade

Reeves pointed out that the foreign interests of the United States are such at the present time that they need expansion rather than contraction. The National Automobile Chamber of Commerce is recommending to its members that they set aside 10 per cent of their productions during the next year for foreign work in order that the automobile export business may be given proper stimulus.

Due to the pressure that is being brought to bear, it is believed that 90 per cent of the provisions cut from the commercial appropriations will be put back into the bill, but the big effort right now is to have the commercial attaches reinstated. If this provision is not included, each American manufacturer will have to send his own traveling men abroad to do the work that these commercial attaches are now doing. To develop a corps of men for foreign representation would take several years, manufacturers declare.

British Tractor Report Resented

Advice to Purchasers to Seek
Availability of Repair Parts,
Called Unfair

LONDON, Feb. 13. (*Special correspondence*)—It is understood in trade circles that the Society of Motor Manufacturers and Traders, Ltd., after a conference with the Royal Agricultural Society, have decided to forego their arrangements for autumn tractor trials, thus leaving the field open wholly to the R. A. S. E. This action will meet with general approval as otherwise there would have been two independent tractor trials in the autumn, and it was obvious that one, if not both, would have been a loss to the promoters.

The recent report of the S. M. M. & T. trials at Lincoln has given offense to one, if not more, American entrants, because of there being appended to the Technical Advisor's report on some of the tractors, certain advice to would-be purchasers to inquire as to spare parts being available for the machine concerned.

It happened that one of the imported tractors thus pilloried by implication is the Emerson, and the importers, a prominent and up-to-date company, naturally resented the remark not merely as being offensive generally, but particularly so in their case as they had given the S. M. M. & T. explicit assurance on the point in reply to an inquiry.

Moreover, it happens that the Emerson is one of the oldest of imported tractors in Great Britain, and even before the present agents were appointed was handled by a highly respectable Lincolnshire firm of motor engineers, the directors of which are mostly farm experts, and therefore not likely to make the sort of mistake referred to.

Government to Sell Metal Washing Soap

WASHINGTON, Feb. 28—The War Department authorizes publication of the following from the Office of the Director of Sales:

The Director of Sales announces that the Ordnance Salvage Board through the District Office, 19 Portland Street, Boston, is offering for sale by negotiation 150,500 lb. of soap powder, located at the plant of the U. S. Cartridge Co., Lowell, Mass., and 23,681 lb. of Fulling, solid soap, located at the plant of the Remington Arms U. M. C. Co., Swanton, Vt.

The soap powder, known as special cleanser No. 6, is a preparation used for washing metals. It is in good condition and is packed in 430 bbl. of approximately 350 lb. each. The Fulling soap is a similar preparation and was used for washing cartridge cases. It is packed in 76 bbl. of approximately 325 lb. each and is in good condition.

Offers for this material are requested. Prices should be quoted per pound f.o.b.

cars shipping point. Sale of this material will be made to the first bidder submitting a price satisfactory to the Government. Shipments will begin within ten days, in so far as possible, from the date of award and will continue thereafter as rapidly as facilities at the disposal of the Government will permit.

Inspection of the soap powder and soap may be made at the storage points. Further information relative to the materials and the terms of sale may be obtained from the Boston District Ordnance Office.

Survey Louisiana in Campaign for Roads

NEW ORLEANS, Feb. 28—The Louisiana Motor League has started a survey of the roads of the State, preparatory to an intensive campaign for the \$25,000,000 to \$50,000,000 bond issued to be asked of the next session of the general assembly for the construction and maintenance of a system of good roads throughout Louisiana. Santley Lemarie, executive of the league, left New Orleans, Feb. 18, on a motor tour of every road in every one of the 63 parishes. His tour will cover approximately 7143 miles and will require between five and six months to complete.

Several national highways tap Louisiana, but there is not now, and never has been, connection between the roads within the State, such as they are, with these national roads, so that whatever improved highways exist within the State, begin nowhere and end in the same place, giving no connection with other states, or with good, all-the-year-round exits from the State. This condition the motor league is trying to correct.

BOSCH PLANS PRODUCTION

SPRINGFIELD, MASS., Feb. 28—By April 1 local officials of the American Bosch Magneto Corp. expect the maximum of 40,000 magnetos a month will be turned out. During January it turned out 32,000 magnetos, an increase of 500 per cent over January, 1919. George A. MacDonald of the corporation says no plans have yet been considered for enlargement of the plant here, although this spring it will be necessary to use all available space. Directors of the corporation had their quarterly meeting at Boston this week, declaring a quarterly dividend of \$2.50 per share on 80,000 shares, placing the stock on a dividend basis of \$10 per share. It previously had paid \$8 per share on 60,000 shares of stock outstanding. The annual report shows a final balance, after all charges and taxes have been paid, of \$15 per share and the earnings this year are expected to total \$20 per share.

START J W P TIRE PLANT

INDIANAPOLIS, Feb. 28—The J W P Tire Co. has broken ground for its new factory at Scottsburg, Ind., to manufacture the J W P pneumatic tire. Scottsburg and Indianapolis men are directors of the concern. According to officials, the first unit of the factory will be ready for production within three months.

Norway Considers Tire Legislation

Proposed Laws Would Require
Pneumatics on All Trucks
Up to 2-Ton Capacity

NEW YORK, March 1—Norway is the first country in the world to propose national legislation that will specify that motor trucks up to two tons capacity must be equipped with pneumatic tires so as to prevent damage to roads and to cut down the excessive cost of highway repairs due to the use of solid tires.

Cable advices to the Goodyear Tire & Rubber Co. indicate that the proposed legislation will be adopted in the near future. In fact, motor trucks shipped abroad by American manufacturers have already been refused admission because they did not conform to the new wheel and tire specifications.

All automobiles used for commercial purposes must be equipped with tires of at least five-inch tread on all four wheels. This means that up to two tons trucks must be pneumatically equipped; from two to three and a half tons either pneumatic or solid equipment of more than five-inch tires is permissible; while trucks of over three and a half tons weight may run on solids.

At present there is some doubt whether or not the new law will apply to city streets, pending legislation being particularly directed against the use of tires of less than five tread on country roads. The Norwegian Government estimates that unless action is taken to specify the sizes of tire widths, the country roads will be totally spoiled within two years.

The new legislation will affect motor truck manufacturers particularly, but in some cases the only change necessary in truck tire equipment will be greater tire width on front wheels—the rear wheels already complying with the provision of the new law.

It is expected that this legislation will be effective from the summer of 1920 onward.

MOTERING GROWS IN CHINA

WASHINGTON, Feb. 28—Motoring is increasing rapidly in Peking, China, according to reports received by the Bureau of Foreign & Domestic Commerce from the Commercial Attaché at that point. Six hundred and fifty passenger cars, chiefly of American manufacture, are operated, of which 500 are owned by Chinese residents. A motor club has been formed to register chauffeurs and to influence road construction. It is expected that China's longest highway, extending from Peking to Tientsin, 80 miles, will be completed within six months. Service stations are urged for China because native owners will not take the trouble to care for their machines properly. They do not bother with lubrication, spark plugs or other parts.

Japan May Switch to European Cars

Consul Reports General Belief
in Superiority of British-
French Makes

WASHINGTON, March 1—Although 99 per cent of the motor vehicles imported into Japan in 1918 were of American manufacture, there is little question, according to Vice Consul E. R. Dickover, in a report to the Bureau of Foreign and Domestic Commerce, that the Japanese will undoubtedly purchase their high-priced cars from England and France as soon as they are available. This is due to the settled opinion that England and French cars are superior to those of American origin.

The demand for automobiles was at its highest in Japan when the armistice was signed, following which there was a business depression. Dealers had placed large orders in the United States and these were filled, leaving the dealers heavily stocked, and some of them for a time were unable to pay the customs duties, with the result that cars accumulated at the customs warehouses and some were sold by the authorities for charges. The remainder were gradually absorbed, however, or re-exported to Java, Shanghai, Straits Settlements and other Far East markets.

The market recovered and in the fall of 1919 automobiles were being imported from the United States at the rate of about 150 per month. The Japanese Government is granting bounties to encourage the use of motor trucks, but in spite of liberal concessions, truck operations have not increased rapidly except in Tokio and Magoya. The Japanese, however, are fully aware of the advantages of motor truck transport and are coming to the realization that good roads are essential for truck operation, and it is probable that the next few years will see great improvement in road construction in Japan.

Accurate statistics are not available as to the number of motorcycles in Japan. But based upon the approximate number in the Kobe consular district, the total for the Empire may be placed at somewhat more than 2000. The types in use are mostly of British and Japanese manufacture. American motorcycles are usually too large and heavy for the Japanese to use, and the high-speed types popular in America are not practicable for the roads in Japan, which rarely permit a speed of more than 20 miles an hour.

BUILDS CANADIAN TRUCK

MONTREAL, March 1—Eastern Canada Motor Truck Co., Ltd., has just completed its factory building in Hull, Que., and expects to have its first trucks ready before the middle of February. The company is entirely Canadian and financed by Canadian capital. The officers are as follows: President, A. K. MacCarthy; vice-president and general manager, G. Gordon Bell; secretary-

treasurer, T. W. MacDowell; sales manager, J. M. Taylor. The directors of the company are T. F. Ahearn, F. E. Bronson, G. S. MacCarthy and Thomas Arnold.

The company is specializing for this season on a 2-ton model called the Veteran truck, although they are equipped to handle orders for larger sizes. The company's engineers have had years of experience in United States truck factories, supplemented by experience in France and Gallipoli with transports where practically every make of truck was represented and studied under the severest working conditions.

MAGNET TRACTOR SHOWN

MINNEAPOLIS, MINN., Feb. 28—A new accession to the farm tractor industry in this city is the Magnet Tractor Co. which made the first public display of its proposed products at the recent Minneapolis show. It is a Minnesota corporation with an authorized capital stock of \$500,000. R. A. Jacobson is president; M. T. Bentzen, vice-president, and Einar Hoidale, secretary and treasurer. The company built a couple of experimental models at the shop of the Lund Machine Co. It is occupying offices at Second Avenue South and Sixth Street and is having a single story 90 by 205 ft. brick factory erected for it at Central Avenue and Eighteenth Street, N. W. The tractor is a three-plow machine with Waukesha $4\frac{1}{2}$ x $6\frac{1}{4}$ in. engine, special transmission and a worm and wheel final drive. A full description will appear in an early issue of AUTOMOTIVE INDUSTRIES.

Lawson to Build 20 Passenger Planes

Milwaukee Company Starts Work
on Giant Biplanes for Trans-
continental Flights

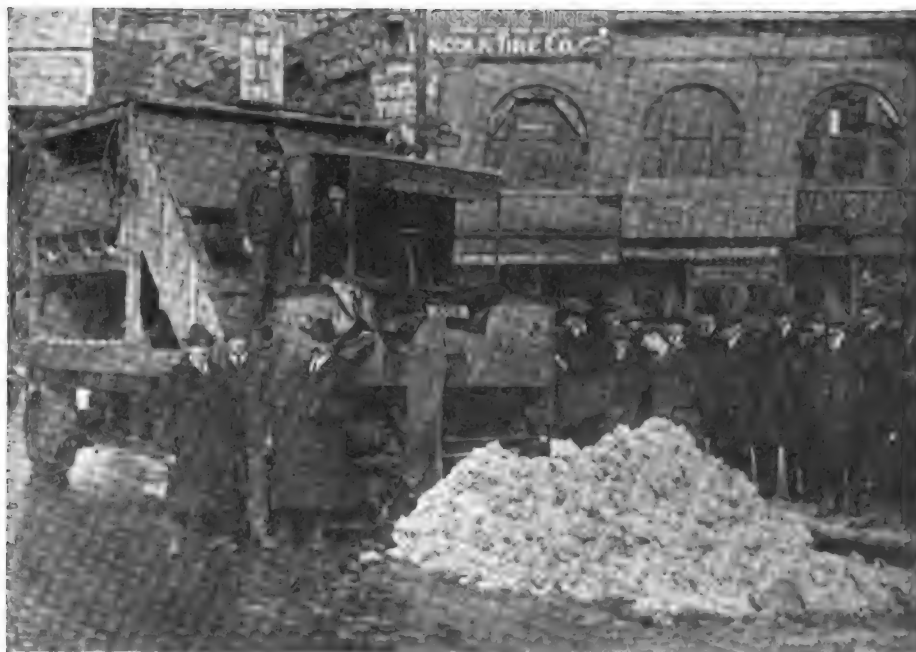
MILWAUKEE, March 1—The Lawson Air Transportation Co. of Milwaukee, which recently achieved historically notable success in negotiating a trip from Milwaukee to New York and Washington and return in a giant biplane carrying 20 passengers, has announced the completion of plans for the construction of twenty planes of the same type which will be put into transcontinental service during 1920 and succeeding years. Four ships are now under construction at the new plant in South Milwaukee.

Contracts have been placed for 100 Liberty-type engines, more than half of which will be delivered by May 1. It is said the new Lawson planes will be equipped with three or four engines, instead of two, as in the pioneer machine. Enough spruce, aluminum, steel, linen and other materials and supplies for twenty ships also have been contracted for.

TWIN ENERGY TO BUILD

ALBANY, N. Y., Feb. 28—Plans for the construction of a new \$1,000,000 factory to be built in Albany by the Twin Energy Motors Co. are being prepared. A site for the new plant has been chosen and building work will be started in the spring.

Does the Work of 750 Snow-shovelers



New York tried out a new device for removing snow recently. It is the invention of Dr. Samuel Friedman. A system of conveyors picks up the snow and deposits it in a receptacle having a capacity of 10 cu. yd. When the container is filled, a door at either side is lowered, a lever pulled, and the snow is dumped into a truck alongside. It is claimed by the inventor that the machine will replace 750 laborers. The above illustration shows the snow-tank at work

New Rail Bill Will Help Motor Trade

**N. A. C. C., in Bulletin, Indorses
Railway Association Plans for
Car Distribution**

NEW YORK, Feb. 28—The interests of motor car manufacturers in the important matter of car service are well provided for in the proposed railroad bill and in the plans of the American Railway Association, says the National Automobile Chamber of Commerce, in a recent bulletin. A representative of the Chamber was in Washington last week discussing plans for handling automobile cars with the car service section of the American Railway Association.

The N. A. C. C. bulletin points out that after March 1 the initiative lies first with the individual lines and secondly with the Interstate Commerce Commission to arrange proper car service rules and agreements. To accomplish this the American Railway Association is deciding to continue the car service section of the United States Railroad Administration at Washington. This will consist of five members, and in the opinion of the N. A. C. C., the personnel will be about the same as at present. Individual railroads are to sign agreements giving plenary power to the commission as to the general control and distribution of cars or any particular group of cars.

For some time the Chamber has been urging the railroads when they go back to private control to make proper provisions for handling automobile traffic. As the Chamber is constantly in touch with the car service section regarding the handling of automobile cars under this plan, they have agreed to a conference with the Chamber on details at an early date. In the event of insufficient or unfair handling or distribution of cars by the railroads, shippers, under the terms of the new railroad bill, may appeal to the Interstate Commerce Commission, which is given full authority over these matters.

Coast Wants System of Military Highways

WASHINGTON, Feb. 27—The maintenance of a national system of motor truck defense and the establishment of military highways in Washington, Oregon and California for the use of heavy motor transport and for the protection of the Pacific Coast, as well as for commercial purposes, is authorized by a bill introduced into the House by Congressman Raker. The bill authorizes the War Department to make an examination and report. It would establish three motor transport trunk lines to be known as the Coast Highway, or first line of defense; the Valley Highway, or second line of defense; the Mountain Highway, or third line of defense.

These highways, together with laterals, are to be included in a system of motor truck transport highways and

post roads. The Coast Highway is to be located at a prudent distance from the Pacific Coast shore, shielded by hills, extending from Port Angeles, Wash., to San Diego, Cal. The Valley Highway, or second line of defense, is to extend from Blaine, Wash., to Calexico, Mexico, and the third highway from Oroville, Wash., to Eureka, Cal., where it will connect with the Coast Highway.

Laterals are to extend eastward from every important harbor to intersect the three highways and the important passes in the mountains. The Office of Public Roads, Department of Agriculture, is to co-operate with the Secretary of War in the survey of these roads, and the sum of \$250,000 is appropriated by the bill to bear the expense of making the survey and report.

City Presents Factory

OTTUMWA, IOWA, Feb. 28—The Iowa Motor Truck Co., manufacturer of the Bell truck, has recently been made a present of a building by the City of Ottumwa. The building was built a few years ago for a manufacturing concern which did not succeed and to make Ottumwa attractive to Bell and his associates the city made them a present of the building, conditional upon the company remaining in Ottumwa for a specified number of years, and maintaining a certain pay roll. The building is two-story, 300 x 225, with two storage buildings, and is located on trackage. It will greatly increase facilities, and the Iowa Motor Truck Co. expects to put out 1000 trucks in 1920. A considerable portion of the output for the past year has gone to the beet growers of the West.

BUYS GOODYEAR "BLIMP"

KANSAS CITY, Feb. 28—Kansas City has purchased the first lighter-than-air craft produced for commercial purposes by the Goodyear Tire & Rubber Co. The Commercial Airship Syndicate of this city is the purchaser and the syndicate expects to put the new craft into operation for commercial aerial transportation by April 1.

The craft is the "Baby Blimp" which has been shown in several air shows in the United States, its first exhibition being at the Chicago show. It is 95 ft. long, 40 ft. high and 28 ft. in diameter and has a gas capacity of 35,000 cu. ft. Its motive power is a 40-hp., 16-valve, four-cylinder engine which will drive it at 40 m.p.h. and its range is about 400 miles and its ceiling 6000 feet.

COMET PRICES RISE

DECATUR, ILL., Feb. 27—The Comet Automobile Co. has increased prices on the Comet Six, Model C-53 passenger car, from \$2,150 to \$2,350 and on the Comet 1½-ton triple tread worm drive truck from \$1,750 to \$1,950.

Trinidad Offers Market for Cars

**Prosperous Conditions Due to
High Prices Creates Motor
Vehicle Demand**

WASHINGTON, Feb. 28—The prosperity of merchants and planters in Trinidad and Tobago due to high prices for sugar, cocoa and cocoanuts, and the boom in the oil industry has increased the possible automobile market, according to a report received by the Bureau of Foreign and Domestic Commerce at Washington.

At the close of 1919 there were 1132 motor vehicles registered, a gain of several hundred within the year. Practically all of the cars used are of American manufacture. The roads of Trinidad are exceptionally good, due to the famous lake of asphalt on the island, which supplies asphalt for road construction. Six hundred miles of highways in Trinidad are suitable for motoring.

There has lately been an increasing demand in Trinidad for motor trucks for commercial purposes, and the more such trucks come into the market here and their economic usefulness is demonstrated the more are orders given for their importation from the United States. But it has been difficult for local agents to get orders filled by American manufacturers, who seem too busy with their home market to trouble with this export trade, and the demand has been partly met by building motor truck bodies on second-hand chassis. It is understood that about forty or fifty motor trucks are under order for Trinidad from the United States. When these arrive the existing number of motor trucks in this colony will probably be about double.

One-ton trucks find a very important use here in hauling cocoa from the estates to the railway stations. Also some of the large merchants are now using 1-ton trucks with imported bodies for store deliveries, for the trucks used for conveying of cocoa the bodies can be made locally, but there is a tendency to make them unnecessarily heavy in proportion to the strength required for the work.

Oil Companies Use Trucks

The local companies engaged in the production of mineral oil are now using 2½-ton, 3-ton and 3½-ton trucks for hauling pipes and heavy machinery. There is also some use of caterpillar tractors with trailers for such purpose. One-ton trucks cost in Trinidad about \$900, 2-ton trucks, \$3,500, 2½-ton trucks, \$4,000 and 3-ton trucks, \$4,500 and upward.

The duty on motor cars and motor vehicles entering Trinidad is 8 per cent ad valorem, British preferential tariff, and 10 per cent ad valorem, general tariff. Locally produced gasoline is used. By agreement among producers it is sold at 48 cents per imperial gallon (1.2 gal.).

Michelin Acts to Safeguard Patents

Steel Disk Wheel Rights in America Sold to Budd Wheel Corporation

PARIS, Feb. 12 (*Special correspondence*)—Michelin steel disk wheels are fully covered by patents, and these patent rights will be upheld in America, declared André Michelin in a conversation to-day.

Michelin stated emphatically that there was no doubt about the validity of his patents covering steel disk wheel construction. Instead of waiting for rivals to attack his patents it is quite probable, he declared, that the Michelin company will take the initiative of protecting its patent rights.

The Michelin steel disk wheel was brought out a considerable time before the war, and was in active production throughout the whole of the war for light trucks and for touring cars. On a moderate estimate, 60 per cent of the French passenger cars to be produced this year will be equipped with Michelin steel disk wheels. In addition to this, large numbers of trucks are being fitted with these wheels.

There is a growing tendency in France to make use of the big dual tires for trucks up to 3-ton capacity, and for this work the Michelin wheel is used exclusively. The first application of the Michelin wheel was on the cheaper grades of cars. It is now being adopted by manufacturers of high-class cars. As an indication, it is declared that the Rolls-Royce Co. has placed an important contract for this type of wheel.

Michelin is building this wheel in France, in his own factories or under his own supervision. In America the rights have been sold to the Budd Wheel Corp. of Philadelphia. Arrangements are being made to manufacture the wheel in England for the British market.

New Syndicate Takes Over Rochester Motors

NEW YORK, Feb. 28.—The Rochester Motors Corp. has been organized by a syndicate headed by Symington, Hoffman & Co., New York, to produce motor car engines on a large scale. They have acquired the business assets of the Rochester Motors Co., Inc. The new corporation will complete contracts held by the Rochester Motors Co., Inc., for the production of the Rochester-Duesenberg four-cylinder engine. The large addition to the factory at Rochester started last fall will be rushed to completion and new machinery for increased production will be placed as soon as possible.

Although orders on hand preclude the possibility of Rochester Motors accepting new business for delivery in 1920, they are already mapping out a greatly enlarged program of production for 1921.

A New York executive office will be opened shortly. The personnel of Roch-

ester Motors consists of the following: President, Donald Symington of Symington, Hoffman & Co.; vice-president, in charge of manufacturing, Charles F. Morley, head of the Morley Machinery Corp.; vice-president, in charge of engineering, Fred C. Kimmel, formerly president of the Rochester Motors Co., Inc.; vice-president, in charge of sales and advertising, Nicholas G. Rost, formerly general salesmanager of the Duesenberg Motors Corp.; treasurer, Edward F. Davison, formerly treasurer of the Rochester Motors Co., Inc.

Harley-Davidson Sets Mile Record at 32.45

DAYTONA BEACH, FLA., Feb. 28.—World's records for motorcycle speed were established here by Leslie Parkhurst on a Harley-Davidson, when he traveled a mile in 32.45 seconds on a machine with 68 cu. in. piston displacement. With a sidecar passenger he traveled a mile in 41.16 seconds in a machine of the same piston displacement. The Warner electric timing device officially approved by the A. A. A. was used in the timing. R. A. Leavell, A. A. A. referee, was in charge of the trials; C. A. Verschoor, official judge, and William Young, police chief of Daytona Beach, clerk of the course. The beach through the trials was in comparatively poor condition as a result of high tides. Parkhurst and other racers estimated a loss of two seconds to the mile because of the heavy condition of the course.

Italy Opens Tourney for Small Planes

PARIS, Feb. 4 (*Special correspondence*)—A competition has been opened in Italy by the National Aerial League for small single or two-passenger airplanes, having a low cost of maintenance. In this competition, which will be held during the coming summer, there will be two distinct classes: machines having engines not exceeding 213 cu. in. capacity and 305 cu. in. respectively.

Two machines which fly with one passenger, with less than 30 hp. have been built in Italy. These are the Macchi and Pensutino. The latter was built by one of the engineers of the Caproni Co.

BUSES IN BUENOS AIRES

NEW ORLEANS, Feb. 28.—According to information reaching the Argentine consul-general in this city, concessions have just been granted to a corporation in Buenos Aires to operate four lines of buses between the heart of the city and the suburban residential districts. One hundred buses, 25 to each line, have been installed, and the fare is 10 cents each way, the same as charged by the street railway companies. The concession is for 50 years, after which it reverts to the city, or can be renewed, as the municipal government prefers. The Commission of Public Works is to be at all times in control of the lines, which must maintain permanent service of at least 90 vehicles.

Would Create Truck Highway System

Congress Gets Bill Proposing System of Specially Con- structed Truck Roads

WASHINGTON, Feb. 28.—The creation of a national department of highways to be known as the Department of Highways, to construct and maintain a national system of motor truck highways, would be authorized by a bill introduced into the House by Congressman Raker. The term motor truck highways would mean roads with strength and capacity adapted to use by motor trucks engaged in transportation of heavy burdens and it would be a system free from toll charges. The purpose of this act is to allay motor truck highways with the general national highway system already authorized by a bill introduced earlier by Congressman Raker and providing for the establishment of a Department of Highways.

The bill authorizes the construction and maintenance of national highways by the national Government, with expenses borne by the Government, although the work of construction and maintenance shall be done through the state highway authorities under the general supervision of the Department of Highways.

The bill divides the nation into ten regional highway areas, authorizing the secretary over the Department of Highways to be appointed by the President, and a body of National Highway Commissioners, ten in number, representing agriculture, commerce, development of native resources, education and economics, manufacture, military engineering, motor truck transport, motor car travel and touring.

The remainder of the bill is practically the same as the earlier bill introduced by Congressman Raker and described in a previous issue of AUTOMOTIVE INDUSTRIES, containing in detail instructions for co-operation with Governors of states by the Secretary of the Department of Highways and granting him the necessary power to take over the office of Public Roads, together with its personnel, equipment, material and supplies.

The bill also appropriates \$25,000 for each square mile unit where the average population is less than the national average population for road construction aside from the Federal-aid appropriations, making these appropriations, which are to be known as equity population allowances, payable in five years in five equal amounts. The bill would appropriate \$10,000,000 to carry out its provisions.

BERGOUGNAN PRICES RISE

TRENTON, Feb. 28.—Increases of about 5 per cent on all tires and tubes above 30x3½ size have been announced by the Bergougnan Rubber Co., effective March 1. In the 34x4 class plain fabric tires will advance from \$36.50 to \$37.95. The non-skids at \$39.75 to \$41.75. Cords \$53 to \$55.50, and tubes \$5.85 to \$6.15.

Tractor Show Board Fixes Regulations

**Closes List of Sanctioned Shows
and Exhibitions Up to
May 15**

CHICAGO, Feb. 28—At a meeting of the National Tractor Demonstration and Show Committee of the Tractor and Thresher Department held in Kansas City, the following action was taken:

"It is the sense of this committee and its representatives, acting under rule four, that no demonstrations held by agricultural colleges or others will be approved excepting those permitted under rule three.

"That this committee will not approve any shows of tractors or tractor drawn or driven machinery held in connection with or under the auspices of retail dealers' associations or thresherman's associations.

"That it is the sense of the committee that any dealer handling or acting as agent for more than one make of tractor and desiring to hold a demonstration or school confined to the makes of tractors he handles shall not be deemed a violator of the rules of this committee, nor shall the manufacturer furnishing tractors to said dealer be construed as a violator of the rules, even though he may furnish expert help for the demonstration or school, same being purely for the purpose of seeing that his machines are properly demonstrated.

"That it is the opinion of the committee that by the term 'purely local in character' used in rule three, the committee understands and rules that this applies to demonstrations which draw or are intended to draw their attendance from the county in which the demonstration is held, or the equivalent in area, but not to exceed the territory actually tributary in the retail trade to the place where the demonstration is held.

"That a demonstration of tractors or tractor drawn or driven machinery in road making is construed by the committee as being the same thing as a 'public field exhibition' as mentioned in rule one, and a combination of plowing demonstration and road making demonstration or other uses of tractor power on different days of the same week and under the same management is deemed by the committee to be a demonstration of more than one day and comes under rule four.

"That no more demonstrations or shows, to be held prior to May 15, 1920, be approved by the committee.

"That all applications for shows national in character be considered at the next meeting of the committee."

GARTLEY-WESTON COMBINE

DETROIT, Feb. 27—Gartley-Weston Co. of Detroit, and the Doherty Metal Plating Co. of Detroit and Sarnia, Ont., have been amalgamated, and both companies now are operating as the Gartley-Weston Co., Inc. The company is incorporated under the laws of Michi-

gan for \$300,000. R. I. Towers of Sarnia is president; P. C. Gartley of Detroit, vice-president and director of sales and advertising; Malcolm MacKenzie of Detroit and Sarnia, vice-president and treasurer; Frank J. Weston of Detroit, secretary, and James F. Perkins of Detroit, production engineer. The company for the time being will devote its energies to the manufacture and sale of Weston auxiliary windshield wings, tonneau wings and direction indicators.

To Fish with Planes

WASHINGTON, Feb. 28—The Bureau of Fisheries plans to use aircraft in aiding tuna and sardine fishermen in finding schools of fish, according to announcement by the Bureau to-day.

Recent experiments with naval seaplanes off the California coast, undertaken with the authority of the Navy Department, have shown the possibilities of "fishing with planes," the Bureau announced, and the continuance and perfection of this service have been the subject of conferences between the Bureau and the Navy Department.

Tractor Must Deliver Power, Court Decides

CALGARY, ALTA., Mar. 1—According to a decision which has been handed down by the privy council it is incumbent on machine companies when selling tractors of a certain horsepower to deliver tractors actually having that horsepower. This was announced as the finding of the council for the Grain Growers in the Emerson-Brantingham Implement Company appeal against the Grain Growers' Association on which case C. E. Gregory, K.C., counsel for the Grain Growers has been in England since the early part of October.

The effect of the privy council's decision is also to give the purchaser of such machine the right to bring action at any time he discovers a deficiency of horsepower.

ROAD ASSOCIATION MEETS

MILWAUKEE, Feb. 28—The Good Roads Association of Wisconsin, at its annual meeting at Madison, elected C. C. Jacobus, member of the Milwaukee county board of supervisors, as president; Elmer S. Hall, Green Bay, was elected vice-president; E. J. Perry, Fond du Lac, treasurer; William H. Reese, sales-manager Sterling Motor Truck Co., Milwaukee, secretary. Francis A. Cannon was reappointed executive secretary and manager. As customary, the association held its annual convention at the same time as the yearly "good roads school" conducted by the Wisconsin State Highway Commission for county highway commissioners and their subordinates. The county commissioners maintain a distinct organization, which co-operates thoroughly with the commission.

British Airway to Link South America

**Lays Out Route from Pernam-
buco to Buenos Aires Cover-
ing 2600 Miles**

WASHINGTON, Feb. 28—An all-British "airway" contract in South America has been completed, according to information received in this country from the American Consulate General at London. The route extends for 2600 miles, with twelve air ports en route, and runs from Pernambuco to Buenos Aires. It appears that keen competition was met with in obtaining this airmail route contract.

According to particulars now for the first time published "the aim in planning the route has been to link all towns of importance with two terminal airdromes. Through dividing the route into fairly easy stages, the airplanes are not required to carry heavy loads of fuel, leaving more capacity for cargo." The total flight is carried out in eleven stages:

	Miles
Pernambuco to Macelo (Brazil).....	125
Macelo to Bahia.....	281
Bahia to Caravellas.....	325
Caravellas to Victoria.....	191
Victoria to Rio de Janeiro.....	281
Rio de Janeiro to Sao Paulo.....	234
Sao Paulo to Florianapolis.....	319
Florianapolis to Porto Alegre.....	250
Porto Alegre to Pelotas.....	176
Pelotas to Montevideo (Uruguay).....	297
Montevideo to Buenos Aires (Argentina).....	125

At first only daylight flying will be carried on. From start to final destination three days will be occupied, passengers having, therefore, to arrange for accommodation at night, and such halts will be at Bahia, Rio de Janeiro and Porto Alegre. This length of time (three days) will mean a saving of six days, compared with the mail boat, but as soon as night flying is undertaken the whole journey will average about 39 hrs. The fee for letters from end to end of the route will not exceed 73 cents.

CHAMPION ENTERS CANADA

DETROIT, Feb. 27—Champion Spark Plug Co. of Toledo is erecting a large plant in Windsor, Ont., which is expected to have a production capacity of 35,000 plugs daily. The plant is expected to be in operation early in the summer.

The new building will contain 15,840 sq. ft. of floor space and will be the largest spark plug plant in the Dominion. The Champion Spark Plug Co. of Canada, Ltd., is the name of the Canadian branch.

FORM NEW TRUCK COMPANY

COOPERSVILLE, MICH., Feb. 28—John H. Toravert will head a new organization here to build automobile trucks, bodies and cabs. A site has been selected and a building 50 x 100 ft. will be erected immediately. Other officers are: L. J. Hinken, vice-president; William Van Allsburg, secretary-treasurer, and Millard Bush, manager.

To Make American Goods in Europe

British-American Industries, Ltd., Formed to Promote Manufacturing Abroad

LONDON, Feb. 6 (*Special Correspondence*)—The American Chamber of Commerce in London says that a new company, known as British-American Industries, Ltd., has been formed to arrange the manufacture of American goods in Great Britain for British and Empire markets.

With the growth of the movement for preferential tariffs and other preferential arrangements among the countries making up the British Empire, many American manufacturers already have considered it desirable to establish factories in Canada. The new company is working, however, on the presumption that the advantages of a factory in Great Britain are infinitely greater for the following reasons:

The British home market is a larger one, and is better situated for export trade, first, on account of steamship facilities to all parts of the world, and, second, because London is the financial center of the Empire and handles a large percentage of the colonial trade; insurances are more easily effected in London; colonial buyers visit London more readily than Canada. British labor, in spite of its unrest at the present time, is still understood to be cheaper and more plentiful than in Canada.

The American Chamber in London understands that the new company will encourage and assist American manufacturers of successful commodities to put down plants in Great Britain, but where the American manufacturer is not interested in doing so and is willing to sell his manufacturing rights the new company will undertake to find British or French manufacturers who will take over those rights. Similarly, it will introduce into America goods which have proved successful in Great Britain or France.

Trade Opportunities in Foreign Markets

WASHINGTON, March 1—The Bureau of Foreign and Domestic Commerce, Department of Commerce, has received requests for automobiles or parts agencies of business from individuals and companies in foreign countries. These are listed below. For further information address the Bureau of Foreign and Domestic Commerce and specify the Foreign Trade Opportunity number.

An automobile dealer in Spain desires to purchase and secure agencies for the sale of automobiles and accessories. Quotations should be given c.i.f. Spanish port. Correspondence should be in Spanish. References. 32122.

An agency is desired by a merchant in Algeria for the sale of tractors. Quotations should be given c.i.f. Oran. Pay-

ment against documents. Correspondence should be in French or Spanish. Reference.

A mechanical engineer from Switzerland has been in the United States for some time; is now about to return to Switzerland, and desires to secure an agency for the sale of automobiles and accessories and tires. References. 32138.

A provincial government in Canada is to expend about \$500,000 during the next two years for road-making machinery, motor trucks, trailers, etc. American firms desiring to bid on these supplies should immediately get in touch with the government engineer. 32103.

A plantation owner in Guatemala desires to purchase two small tractors with trailers. Quotations should be given f.o.b. Atlantic port. Payment, cash against documents. Correspondence may be in English. Reference. 32110.

Financial Notes

Packard Motor Car Co. has declared a regular quarterly dividend of 1% per cent on preferred stock, payable March 15, to stockholders of record Feb. 29.

American Rubber & Tire Co. stockholders voted last week to increase the capital from \$675,000 to \$4,000,000, one-half to be common and one-half first preferred, 8 per cent cumulative stock. The company's statement shows an increase of 128 per cent in net sales over 1918.

Detroit Steel Products Co., in its report for the year ending Dec. 31, filed with the Detroit Stock Exchange, reports assets aggregating \$4,155,930.66 with current assets of \$3,132,206.11. Current liabilities of \$1,444,655.20, and a surplus of \$1,527,062.13.

Wichita Falls Motors Co., Wichita Falls, Tex., has increased its capital stock from \$800,000 to \$1,800,000, all of the new issue being taken by stockholders.

Auto Parts Corp. annual report for 1919 shows a balance of net earnings, after deduction of dividends and taxes, equivalent to \$1.85 a share on the \$4,029,569 of outstanding common stock of \$50 par value. The report shows total assets of \$7,177,026 and a surplus of \$273,741.

Selden Truck Corp. will pay dividends of 2 per cent on the first preferred stock April 1, and the regular quarterly dividend of 2½ per cent on the second preferred stock will be paid at the same time to stock of record March 16.

Reynolds Machine Co., manufacturer of automatic screw driving machinery, has increased its capitalization from \$200,000 to \$500,000, and is preparing to enter the manufacture of tire molds and equipments.

The Mason Tire & Rubber Co., Kent, Ohio, is offering for sale a quantity of both preferred and common stock in the corporation, which recently was re-incorporated with a capital of \$7,500,000.

Companies Plan Marysville Plants

New Wills-Lee City of 60,000 Population Attracts Manufacturers

DETROIT, Feb. 27—John R. Lee, associated with C. Harold Wills in the new corporation which will produce a high-class automobile in a plant being erected at Marysville, Mich., gave details of the plans for creating a city of 60,000 in a court proceeding in Port Huron, this week. The statement is important in that it reveals the names of several of the parts manufacturers who will establish large plants in the new city. Lee announced that he would prefer to withhold the names of three or four others who will erect factories in Marysville.

The General Aluminum & Brass Co. already has bought a plant in South Port Huron and contracts have been let for its plant in Marysville, railroad sidings for which have been laid. The Marysville plant of the General Aluminum Co. will occupy a 30-acre site.

The Detroit Gear & Machine Co. will erect a big plant near the site of the Wills-Lee factory and the Canadian Brass & Metals Co. has an immense plant well advanced.

Adjoining the General Aluminum site the Athol Manufacturing Co., of Athol, Mass., manufacturers of rubber cloth and other materials for automobile tops, has secured a large site and started plant construction, and the Williams Co., of Alliance, Ohio, one of the large producers of drop forgings in the United States, has begun construction of a \$1,000,000 factory.

The Wills-Lee Corporation has foundations in for five new factory buildings, which will be ready for occupancy April 1, furnishing 150,000 sq. ft. of working space. Three units of the larger four-story factory will be built this spring, adding 1,250,000 sq. ft. of floor space. The company expects to have 2500 men at work Sept. 1, and 7000 a year from now. The city is now being laid out and houses rapidly are being erected to accommodate employees and their families.

The United States Steel Corporation, it is said, will erect a blast furnace and sheet mill near the site, though no confirmation of this report is obtainable.

HAYES SALES \$14,686,383

JACKSON, MICH., Feb. 27—Hayes Wheel Co. reports net sales last year of \$14,686,383.16, approximately double the total for 1918. A total of 956,991 sets of wheels were shipped during the year. The production program for 1920 representing approximately \$80,000,000 in sales is planned.

The company paid dividends last year amounting to \$125,999.40, and Federal taxes of \$610,000, leaving a balance of \$765,565.45 net profit for the year. This added to the surplus made the amount on hand Jan. 1, 1920, \$1,599,340.74.

Fisher Gets Plans for Cleveland Plant

CLEVELAND, Feb. 28—The architects' plans for the new factory to be built in this city by the Fisher Body Co. have been completed. The structure will be one of the largest one-unit plants in America. It will be six stories in height, have 1,500,000 sq. ft. of floor space and will extend along Coit Road 1300 ft. and 700 ft. along East 140th Street. The cost of constructing the new building alone will approximate \$500,000.

The plant will have a frontage on the New York Central and New York Belt Line railroads. Power plants, dry kilns and other equipment necessary to the equipment of the factory will be constructed on the tract, which consists of 40 acres.

The plans are in the hands of contractors, and bids will be submitted within two weeks. Some of the steel contracts already have been awarded and fabrication has been going on for some time. Other materials have been obtained by contracts as a matter of protection against advancing prices, with the result that considerable money has been saved.

The plant will have a frontage of 2350 ft., or nearly half a mile. The part which is to be used for the body plant will be 72 ft. deep and that for the paint shop 120 ft. deep.

FORM NEW FORGE COMPANY

MILWAUKEE, Feb. 28—The development of Milwaukee as the greatest producing center of automotive parts and materials in the entire United States has brought into being a new drop forge enterprise of large proportions. It is the Interstate Drop Forge Co., which has been incorporated for \$250,000 by Maj. Sherman M. McFedries, 624 Shepard Avenue, who served in the Ordnance Corps during the war. Contracts were awarded during the week for the first units of the new plant at Hopkins and Thirty-third Streets, consisting of a forge shop, 100 x 150 ft., and a machine shop, 75 x 100 ft.

AUSTIN LEASES PLANT

GRAND RAPIDS, MICH., Feb. 28—Austin Automobile Co. has leased a four-story building and will occupy it as an addition to the present plant as soon as alterations can be made. The new factory will give the company largely increased capacity and it will start with orders sufficient to keep the plant busy for several months. The Austin company has its parts manufactured at various places, under contracts, and assembles them in Grand Rapids.

CANADIAN PLANT OPENS

OSHAWA, ONT., March 2—The new plant of Olds Motor Works, Ltd., of Canada, a General Motors subsidiary, began operations March 1. Canadian requirements for Oldsmobile trucks and passenger cars will be filled by this plant. It is planned to produce 5000 trucks and cars the first year.

Current News of Factories

*Notes of New Plants—
Old Ones Enlarged*

Stockholders Plan

Purchase of Fulton

NEW YORK, Feb. 28—It is understood that stockholders of the Fulton Motor Truck Co., which is to be sold at auction by John S. Sheppard, receiver, at Farmingdale, L. I., on March 11, have completed plans for the purchase of the business at the sale and the reorganization of the company.

A man who has been president of a large truck company in the Middle West, whose name is withheld for the present, is said to have announced his willingness to subscribe heavily toward buying the business at the sale. He is slated for the presidency in the reorganization scheme.

Frederick Flynn, of New York, who is acting as trustee for the funds and is working in the interest of the stockholders through the Fulton Stockholders' Protective Committee, is authority for the statement that the property will be purchased by them.

The reorganization plan contemplates the incorporation of the Fulton Motors Corp. in Delaware with \$150,000 capital Class A shares of \$10 par stock and 350,000 Class B shares without par value.

J. E. Conant & Co., Lowell, Mass., has arranged to hold the sale at the plant at 12.30 p. m. Thursday, March 11, in accordance with the decree of sale issued by Judge Learned Hand Jan. 28.

MILWAUKEE FOUNDRY BUILDS

WAUKESHA, WIS., March 1—To meet greatly increasing demands for brass and bronze castings and parts from the automotive industries, the Waukesha, Wis., Brass Foundry Co. has purchased a tract, 170 x 300 ft., and will build a complete new shop group costing about \$100,000 when completed. It will be built in two units, ground for the first being broken to-day. The presence in Waukesha of several large automotive plants furnishes a material home consumption.

TO EXTEND FABRIC PLANT

SHERBROOKE, QUE., March 1—Financial arrangements are now being made through the sale of \$3,000,000 of 8 per cent cumulative preferred stock which will enable the Canadian Connecticut Cotton Mills, Limited, to erect an addition to its plant at Sherbrooke, Que., increasing its capacity by about 100 per cent. The new addition will contain 400,000 sq. ft. of floor space and will be built of brick and steel with modern lighting, heating and plumbing. The new mill will be devoted to the manufacture of automobile tire fabrics, furnishing employment for about 900 operators.

Stoughton Wagon Forms Timber Supply Branch

STOUGHTON, WIS., March 1—The Stoughton Wagon Co., of Stoughton, Wis., which in recent months had developed and is now manufacturing a motor truck trademarked the "Stoughton," has organized a subsidiary corporation, known as the Ozark-Badger Co., capital stock, \$15,000, to facilitate the securing of an assured timber and lumber supply for the works at Stoughton.

Two sawmills, with a capacity of four to five carloads daily, at Wilmar, Ark., have been purchased by the new Wisconsin corporation, and will provide steady supplies of oak, hickory, pine and red gum, most of which will be shipped from Arkansas to Wisconsin. F. J. Veal, president of the Stoughton Wagon Co., is head of the new concern. J. F. Knowles, of Wilmar, is vice-president, in charge of the sawmill operation in Arkansas.

WESTINGHOUSE ENLARGES

MILWAUKEE, March 1—The Milwaukee works of the Westinghouse Lamp Co. at 3100 Center Street are being enlarged at a cost of \$400,000 to provide about 100,000 sq. ft. of much-needed floor space. Two 2-story fireproof factory additions, 80 x 250 and 80 x 200 ft., will be erected and will be ready for occupancy about July 1. At that time the present force of 560 employees will be increased to approximately 1000. Harry M. Robbins is general manager.

STEARNS FOUNDRY OPENS

LUDINGTON, MICH., Feb. 28—The new foundry building erected by the Stearns Motor Manufacturing Co. now is in operation doubling the plant output. The factory now employs 200 men, and plans several more additions, and a largely increased payroll during the coming summer. It manufactures tractors and farm light plants.

TO DOUBLE GASKET OUTPUT

DETROIT, Feb. 28—Springman Paper Products Co. has purchased the plant of Schwanbeck Bros., comprising approximately 500 sq. ft. of floor space, doubling facilities for production. The Springman company began business 14 years ago in a barn, catering to the lithographing and printing trades. It was one of the first to enter the paper gasket business as the automobile industry developed in Detroit, and at present is one of the largest firms in this line in the country, doing a business of approximately one-half million dollars a year. The company also manufactures a high grade gasket packing. Officers of the company are: Charles T. Springman, president; Lloyd H. Diehl, vice-president; Russell Springman, secretary; O. E. Werner, treasurer.

ROWE TO INCREASE OUTPUT

LANCASTER, PA., Feb. 28—The Rowe Co., manufacturer of automobile trucks, is planning to increase the output from ten to twenty trucks a day.

Delion Tire Taken by Baltimore Interests

TRENTON, N. J., Mar. 1.—The Delion Tire and Rubber Co., of Trenton, N. J., has sold its entire business, name, goodwill, trade-marks and certain other properties to Walter C. Price and associates, of Baltimore, Md., who have reorganized the company, obtaining a charter under the laws of the State of Maryland, with the same name, with an authorized capital of \$1,500,000. Price was formerly president of the Price Hardware Co., wholesale merchants at Pulaski, Va.

The company will erect a modern, up-to-date factory in Baltimore, with an initial capacity of 400 tires per 24-hour day, and will manufacture the highest quality of fabric and cord tires and tubes.

The Delion Tire and Rubber Co. had been conducting a tire manufacturing business since 1915 at Trenton.

Manufacturers Join in Civic Pride Show

CLEVELAND, Feb. 28.—Automobile manufacturers of Cleveland lent themselves to a new advertising feature, when they combined in a civic pride automobile show, staged by the May Co., a leading Cleveland department store, in a display of made-in-Cleveland-only automobiles. The show was held on the third floor of the department store, the following manufacturers being represented: Winton, Ferris, Peerless, Jordan, Chandler, Cleveland, Stearns and Grant.

TAKES UNION STEEL AGENCY

DETROIT, Feb. 28.—Don F. Kennedy, metallurgist and manufacturers' agent, of 1257 David Whitney Building, has taken the agency for Michigan of the Union Electric Steel Co. of Pittsburgh, manufacturers of tool and alloy steels. This company at present is producing ingots and billets and is installing a conversion plant which will soon place it in a position to produce finished bars, die blocks and steam hammer forgings. Kennedy is also handling the towmotor in Michigan and Toledo.

OPENS CHICAGO OFFICE

CHICAGO, Feb. 28.—Permanent offices and salesrooms have been opened in Chicago by the Black & Decker Mfg. Co., manufacturers of service shop equipment and automobile machinery. The new office is in charge of R. O. Ames, whose territory has been extended to cover the entire Middle West.

TO CHOOSE AVIATORS

PHILADELPHIA, Feb. 28.—Joseph A. Steinmetz, president of the Aero Club of Pennsylvania, has received notice from the Aero Club of America that his club will be allowed to choose the aviators who shall represent Pennsylvania in trials for the selection of pilots to compete in international air contests which are to be held this year in the United States, France, Italy and Monaco.

Men of the Industry

Changes in Personnel and Position

H. M. Jackson has been promoted to the post of factory manager of the Hess-Bright Manufacturing Co. E. N. Bernhard, who served for a considerable period as planning manager of the company, has been made assistant to the general factory manager.

F. L. Waite, for seven years advertising manager of the Reo Motor Car Co., has resigned, effective March 1. His plans for the future have not been made public.

Roscoe Robinson has resigned from the production department of General Motors Truck Co. in Pontiac, and will join the organization of the Bethlehem Motors Corp. in Pennsylvania.

George H. Finn, vice-president of the McJunkin Advertising Co., Chicago, has been elected to the directorship of the Baker Tractor Corp. He will be in direct charge of merchandising.

E. H. Hiatt, for five years factory manager and engineer of the Saginaw Sheet Metal Works, manufacturers of automotive sheet metal parts, has resigned.

R. J. Parvin is handling the business of the William R. Johnston Manufacturing Co. of Chicago, manufacturer of plate glass auto curtain windows. Parvin was for five years salesmanager of the Ponberthy Injector Co.

P. J. Dasey has tendered his resignation as salesmanager of the Blodgett Engineering & Tool Co., and will rejoin Lon Smith, of the Midwest Engine Co., Indianapolis. Dasey will be engaged in research and sales engineering work. He served with Smith as sales engineer of the Buda Co.

F. Van Z. Lane, who resigned as chief engineer for the Packard Motor Car Co., has been succeeded by T. Harris Smith, transportation engineer of the Packard New York Co.

S. G. V. IS REORGANIZED

NEW YORK, Feb. 28.—Announcement is made of plans for the reorganization of the S. G. V. Motor Car Co., and for the resumed production of S. G. V. cars at an early date.

Lovett A. Grant, who was general manager in charge of production at the S. G. V. factory in Newark, and for the past four years has been engaged in the manufacture and distribution of S. G. V. parts, is to head the new company.

Grant announces that plans of the company provide for the continued manufacture of cars on a quality basis. Distribution will be made at the start only in the larger cities of the country.

Temporary offices of the new S. G. V. company have been established at 250 West Fifty-fourth Street, New York City.

New Heads Named of Chamber Departments

WASHINGTON, Feb. 28.—Chauncey D. Snow, former commercial attache at Paris, has been appointed head of the Department of Foreign Trade by the Chamber of Commerce of the United States.

Organization of an insurance department is announced by the Chamber of Commerce of the United States, with M. B. Trezevant as its manager. The insurance department is one of six or seven new departments which the Chamber is organizing to afford specialized facilities for dealing with subjects in important fields of American business. The new department will, on the one hand, familiarize itself with the peculiar problems of all kinds of American insurance, and on the other hand, will seek data from the point of view of business men who are users of insurance.

National Truck Tour Entries Close May 1

OMAHA, Feb. 28.—Entry for the First National Motor Truck Reliability Contest, to be run out of Omaha, starting on or about May 31, will close in Omaha on May 1. The trucks for the contest will have to be in the hands of the technical committee at Omaha by May 21. Charles P. Root, general manager of the tour, has made an inspection of part of the route recently. He found many of the proposed roads being traveled and decided upon some changes in the routings to make possible night and noon stops at larger cities.

"Y" TRAIL OFFICERS CHOSEN

MILWAUKEE, March 1.—H. B. Whiley of Miles City, Mont., was re-elected president of the Yellowstone Trail Association at the annual meeting of the executive committee, held in Milwaukee for the first time. John N. Willys of Toledo was elected vice-president of the Eastern division; Ray Smith of Milwaukee, vice-president of the middle division, and Dan Bass of Seattle, Wash., vice-president of the Western division. The entire "Y" trail will re-marked this spring.

EMERSON OFFICIALS CHANGE

ROCKFORD, ILL., Feb. 28.—O. M. Peters, until recently general superintendent of the Emerson-Brantingham Co., has resigned to become general manager of Clark Brothers Co., New York. W. L. Clark has been appointed domestic salesmanager for the Emerson-Brantingham Co., with Frank M. White as his assistant.

VORHIS NAMED MANAGER

CHICAGO, Feb. 28.—H. S. Vorhis has been appointed general manager of the Mid-West Rubber Manufacturers' Association, with headquarters in the McCormick Building, Chicago. Vorhis is well known in the rubber trade through his former connection with the Rubber Association of America.

Calendar

SHOWS

March 6-13—New York, N. Y. Second Annual Aeronautical Exposition, Manufacturers' Aircraft Assn., Inc., 71st Regiment Armory. Walter Hempel, Manager.

Mar. 6-13—Greenville, S. C. Carolina Automobile Show. Greenville Dealers' Assn. Textile Hall.

Mar. 7-13—Muskegon, Mich. Automobile Show, Muskegon Auto Business Men's Assn. J. C. Fowler, Manager.

Mar. 8-13—Indianapolis, Ind. Annual Automobile Show, Indianapolis Auto Trade Assn. Manufacturers' Bldg. State Fair Grounds. John B. Orman, Manager.

Mar. 10-13—Lebanon, Pa. Annual Motor Show. Automotive Trade Association of Lebanon. James Furniture Store-Bldg. J. Paul Buck, Manager.

Mar. 12-20—Boston, Mass. Annual Automobile Show. Mechanics' Building.

Mar. 15-20—Great Falls, Mont. Automobile Show. Montana Automobile Distributors' Association.

Mar. 20-27—Trenton, N. J. Annual Automobile Show. Armory. Trenton Automobile Dealers' Assn. John L. Brock, Manager.

Mar. 20-27—Pittsburgh, Motor Square Garden. Automotive Association, Inc. John J. Bell, Manager.

Mar. 22-27—Duluth, Minn. Automobile Show. Duluth Auto Trades Assn. W. F. Daly, Director.

Mar. 22-27—Utica, N. Y. Annual Automobile Show. Utica Motor Dealers' Association.

Mar. 22-27—Oklahoma City, Okla. Annual Automobile Show. Oklahoma City Motor Car Dealers' Assn. G. W. Woods, Manager.

April 21-28—San Francisco. National Aeronautic Exposition. Exposition Auditorium.

Oct. 6-16—New York. Electrical Show. Grand Central Palace. George F. Parker, Manager.

July—London, England. International Aircraft Exhibition. Olympia. The Society of British Aircraft Constructors.

CONTESTS

August, 1920—Paris, France. Grand Prix Race. Sporting Commission Automobile Club of France.

June, 1920—Omaha, Neb. Reliability Truck Tour.

FOREIGN SHOWS

March—London, England. Motor Boat Marine and Stationary Engine Exhibition.

March—Adelaide, Australia. All Australian Exhibition of motor vehicles, airplanes, engines and automotive equipment.

March 1-15—Lyons, France. Automotive Products, Lyons Industrial Fair.

April or May—London, England. Commercial Vehicle Exhibition. Olympia.

April 3-May 4—Buenos Aires. Exposition of U. S. manufacturers.

CONVENTIONS

May 9-12—Independent American Petroleum Congress, Congress Hotel, Chicago.

May 13-20, 1920—San Francisco, Seventh National Foreign Trade Convention.

S. A. E. MEETINGS

Mar. 10—Aeronautic Dinner and Meeting. S. A. E. Headquarters, New York.

Manufacturers Act to Aid Patent Office

WASHINGTON, Feb. 28.—Manufacturers from various sections of the country testified before the House Rules Committee this week on the Nolan bill, providing a 10 per cent increase in the force of the Patent Office and a 20 to 25 per cent increase for Patent Office employees. One delegation representing the National Association of Manufacturers was headed by Milton Tibbetts, patent counsel of the Packard Motor Car Co. This delegation comprised twenty-one representatives of manufacturers.

The Patent Office has been threatened with collapse because the wages of the patent commissioners and other employees have not been increased for several decades and the workers are unable to meet the present cost of living and retain their positions.

"The employees of the Patent Office have been resigning steadily," Tibbetts told members of the House. "An increase of pay is the only thing that will keep the organization from being thoroughly wrecked."

"If that is allowed to happen," said Tibbetts, speaking for the National Association of Manufacturers, "the losses, confusion and delay will be enormous. Moreover, they will continue for years, because the work of the office depends upon long training and exact knowledge."

"The delay in giving the men salaries large enough to cover their living expenses will be one of the worst economies imaginable."

"The loyalty of the Patent Office employees has been splendid, but they can't be expected to remain on salaries that are too small to support their families."

"This life-saving bill has been recommended for passage by the Patent Committee of the House and is now up for

consideration by the Rules Committee. The manufacturers of the country will persist in using their strongest efforts to have this bill passed as demanded by the industrial life of the country."

Propose City Garage as Parking Remedy

NEW ORLEANS, Feb. 28.—Because of the fact that the parking of cars in cities is so closely connected with sales possibilities, car manufacturers may be interested in an experiment that has been proposed here. It is not yet assured that the plan will be tested, but it is outlined as follows:

Joseph A. Blythe, a real estate man, has proposed to the City Commissioners that the city purchase seven blocks of poorly improved property near the center of the city, and build thereon parking garages, in which cars could be stored for short intervals at a nominal cost. Blythe has represented that this method of handling the situation would be of benefit to all car owners, would do much to check thefts and would abate to a large extent the parking alongside the streets in the shopping and office building district, which has become a nuisance.

BUYS HOPEWELL (VA.) SITE

WILMINGTON, DEL., Feb. 28.—The Mayhew Steel Products, Inc., of 291 Broadway, New York, according to an announcement made by the du Pont Chemical Co., has taken a 10-acre site at Hopewell, Va., on which it will erect a new plant. The company, which now has a plant at Shelburn Falls, Mass., manufactures automobile tool kits and mechanics' hand tools. The Hopewell plant will be used exclusively in the manufacture of pliers and wrenches. It is expected to have the establishment in operation by July 1.

Army to Build Plane Base on Staten Island

NEW YORK, Feb. 28.—New Dorp, Staten Island, is to be the site of an aerial coast defense station being built for the Army Air Service as a base for land and sea planes patrol aircraft to guard the Atlantic shores. The new station covers approximately 413 acres, with a frontage on the ocean of 1750 ft., and is located on the old Vanderbilt estate. Work on the hangars and piers is now under way.

The new station has been named Miller Field, in honor of Capt J. T. Miller, who was killed in action in Corpeny, France, March 8, 1918. The field will be complete in every particular. A wireless transmitting station and a separate wireless receiving station will be erected. The landing ground is in the center of the quadrangle formed by the buildings and ocean. The beach will be equipped with a marine railroad for hoisting sea-going aircraft ashore.

EX-AVIATORS FORM COMPANY

AKRON, OHIO, Feb. 27.—The National Airway Service Co. of Akron, with a capital of \$80,000 has been incorporated here by Lieut. L. F. Ross, J. G. Layton, R. C. Norris, E. Loquist and Lee Myers, ex-army pilots, all of whom were in active service overseas.

With the purchase of new machines plans for commercial aviation will be perfected. Business will be established in every phase, including passenger cars, aerial photography and a school of instruction in flying. An aerodrome will be maintained here as a base for the operation of pilots and for the use of visiting machines.

Negotiations have been concluded for representation here of the Inter-Allied Aircraft Co. of New York.

AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

VOL. XLII

NEW YORK—THURSDAY, MARCH 11, 1920

NO. 11

Aircraft Makers Exhibit the 1920 Commercial Models

The war was forgotten in staging the second national show of the Manufacturers' Aircraft Association, only models suited to industrial purposes being shown. The advancement of airplane construction in America and its future development, in addition to descriptions of the various models on exhibition, form the basis of this article.

New York, March 8.

THE second national show of the Manufacturers' Aircraft Association, depicting the year's commercial development of airplanes and dirigibles, opened in the armory here of the Seventy-first Regiment on March 6, and will continue throughout this week. No military models were shown; the entire exhibit was devoted to the peace-time building of both heavier-than-air and lighter-than-air vehicles.

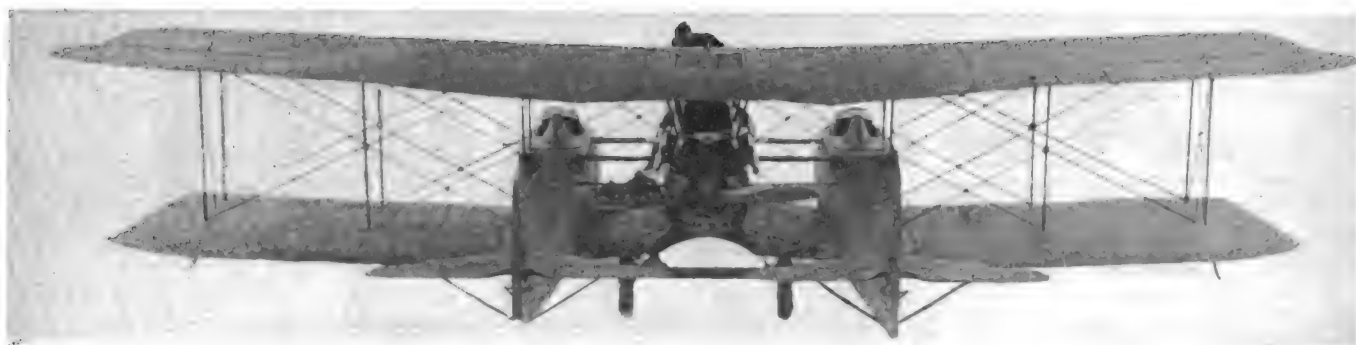
Several factors of interest to the automotive industry were outstanding features of the show. The first of these was the fact that the airplane has found a commercial field and that the building of airships has not ceased with the completion of the Army and Navy program evolved during the period of hostilities. The aim of the showing was to prove that the construction of planes and balloons had become an industry that could look to the civilian population for at least a measure of support.

In other words, whereas the show of 1919 was largely to display to an interested crowd of exhibitors the progress that had been made in building for military purposes, the exhibit of 1920 took on the char-

acteristics somewhat of the present-day motor car show. Salesmen sought for prospects and builders were expectant that these civilian prospects would furnish them the means of carrying their factories through the financial pathways of the coming year.

From the talk of the salesmen and the aspect of the exhibits themselves, a visitor might easily have obtained the impression that such business had grown to large volume and that the coming year was an assured one for the manufacturers. However, such a view probably is over-optimistic. Many of the companies have come through their first after-hostilities year in a more or less sound financial condition, and others seem to see their way clear for a continuation of that success during 1920. But the civilian use of planes, for purposes of carrying freight and passengers, is yet in the experimental stage, its future dependent upon many things.

Much Government work was carried on during the year just past, and some is now under way that will carry well into 1920. One and perhaps two firms have built up a strong sales force, with distributors, sales agents, service stations and landing fields, represent-



The Thomas-Morse Mail Plane

This machine, with two engines, one mounted in the front as a tractor and one in the rear as a pusher, in the center nacelle, was one of the outstanding engineering features of the show. Its many interesting features are described in the accompanying article. These pictures show a front and rear view.

ing an outlay of missionary work that may bear good fruit in the coming months. Other companies are looking forward with an optimism that should carry them well ahead, although some of them expect this year to be a more critical one than that just finished, being dependent, as is expected, more upon civilian than Government support.

The work during last year of putting the plants on a basis of commercial production has been gratifying. Each of the companies exhibiting—their number, unfortunately, being smaller than that of 1919—had ships well adapted for non-military use, most of them designed along lines of comfort and practicability. Much work has been done in converting Army or Navy planes into well-furnished and well-finished transport or freight carriage machines. No “freakish” development was encountered, and it was evident that the makers have gone carefully into the business of making the airplane a capable and sturdy carrier.

The New York show, in many respects, was similar to that recently held at Chicago, the various features of which were described in *AUTOMOTIVE INDUSTRIES* of January 22. Curtiss exhibited the same machines, an improved Eagle being shown here, however. The Aeromarine company showed one additional model here and Dayton-Wright made similar displays at both places. L-W-F, which had a ten-ton freighter and a diminutive model here, did not show at Chicago, that also being true of Ordnance, West Virginia, Thomas-Morse and several other companies that were represented here either by models or by engines alone. The Interallied Aircraft Corp., United Aircraft, Inc., and the American Aircraft & Supply Works exhibited only at Chicago.

The exhibitors here were the following:

The Thomas-Morse Aircraft Corp., Ithaca, N. Y.

The Dayton-Wright Division of the General Motors Corp., Dayton, Ohio.

The Ordnance Engineering Corp., New York.
Curtiss Aeroplane & Motor Corp., New York.
L-W-F Engineering Corp., College Point, L. I.
Aeromarine Plane & Motor Corp., New York.
Goodyear Tire & Rubber Co., Akron, Ohio.
West Virginia Aircraft Corp., Wheeling, W. Va.

In addition to these companies, all of which exhibited completed machines, the Glenn L. Martin Co. of Cleveland, Ohio, and the Gallaudet Aircraft Corp. of New York, exhibited models or pictures of their planes. The Ace, a new machine of small size, and the British Bristols were exhibited at hotels near the armory. Several manufacturers were not in evidence, notably Loening. The accessory field was rather large, a number of engines being shown, principally the Wright-Hispano, the Packard, the Lawrence and the Beecher, the latter an eight-cylinder opposed air-cooled engine made at New Haven, Conn. Instrument, wire, fabric, varnish and similar exhibits filled the remainder of the exhibit space.

From an engineering standpoint, interest was large in the new mail plane of the Thomas-Morse company. This machine was of the two-fuselage and center nacelle type, with the nacelle carrying two 300-hp. Wright-Hispano engines, one mounted in front and one in the rear. A more detailed description will be given later in this article, but among its salient points are the following:

High ratio of plane weight and useful load, the latter being almost as much as the former.

The small wing weight. Including struts and wires, this was stated to be 0.9 lb., in contrast with a customary weight of from 1.1 to 1.5 lb.

The extremely large wheels, affording easy landing on rough ground, or affording a “snow-shoe” effect on soft ground.

The light landing gear.

The strut fittings.

The high power, the machine being able to remain in flight with one engine off and capable of taking off under the same conditions.

The engine mounting.

All of the features of this machine were said to mark it as one of the most notable aviation achievements of the year. Four of this type are under construction for the aerial mail service and comprehensive flight tests already have been made at Ithaca, N. Y.

Interest also was large about the new machines of the L-W-F company, both of which also will be described. These consisted of a ten-ton freighter and a small monoplane, having an empty weight of less than 600 lb. The latter was the only plane under exhibit that mounted an air-cooled engine, using the Cato two-cylinder opposed, although the Ordnance company showed a model equipped with an Anzani air-cooled plant. Like the small L-W-F plane, the Ordnance model was a monoplane, but was designed to seat two passengers. The engine was rated at 50 hp., the wing span being 30 ft. and the sale price fixed at \$4,500.

The largest exhibits were the Curtiss and the Aeromarine, both of which were similar to those at Chicago. In addition to the 50-B-2 flying boat of the latter company, which was shown at Chicago, the company displayed a model No. 40, seating only two passengers and being equipped with a six-cylinder instead of an eight-cylinder engine. Another model hull also was shown, in which the two passengers sat in an enclosed cabin, with the

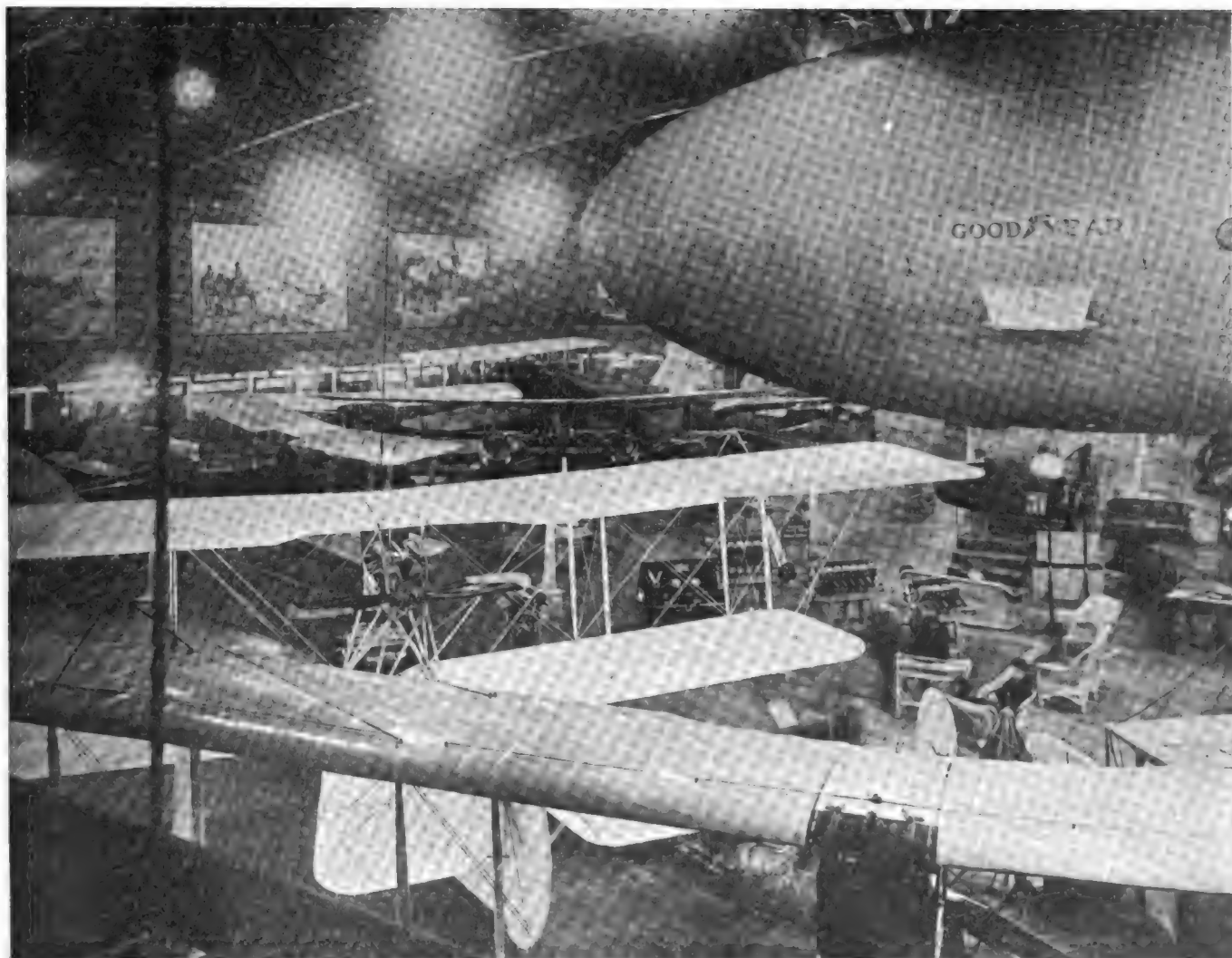
pilot outside in the bow. Aeromarine featured the commodious fittings of their models, a tendency that was noted throughout the exhibits.

This tendency in present construction is similar to that taking place in Europe, and shows the strides being made by manufacturers to overtake the commercial field. Makers are adopting automobile terms, as well as automobile fittings, for their models, coupé, sedan, limousine and similar nomenclature being heard throughout.

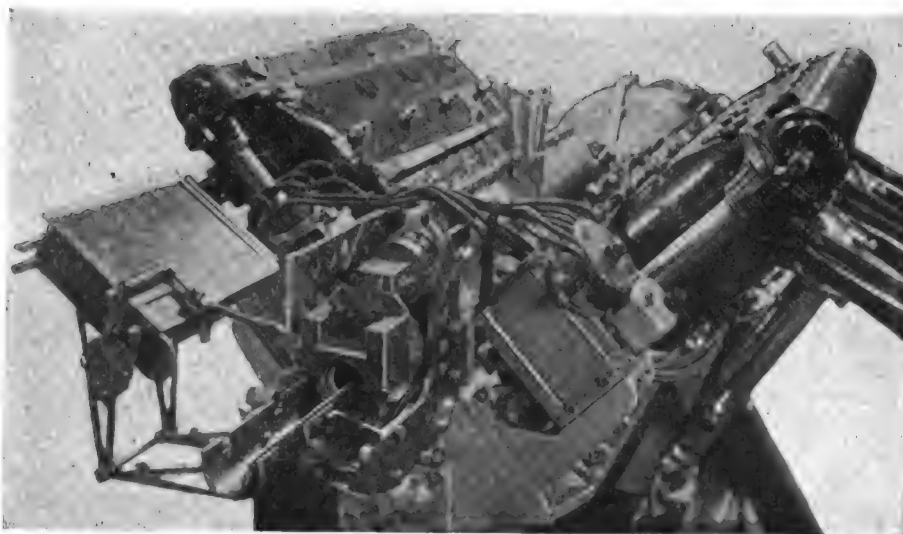
Development during the past year, as shown by the exhibits, has largely been along conventional lines; refinement of fittings going on apace with an apparent tendency for higher power and enlarged capacities. Nothing was on the floor that exhibited freakish lines. Construction remained of the biplane type, no triplanes being shown, and the monoplanes being confined to the L-W-F and the Ordnance companies. Engines, with few exceptions, were stationary and water-cooled, this feature having been influenced, perhaps, by the great amount of work that was done during the war on the Liberty. Curtiss, Wright-Hispano and Liberty engines were predominant as to number actually shown.

Four engines were shown or listed that departed from the stationary and water-cooled type. These were the Cato, used in the L-W-F, the Lawrence three-cylinder

Showing the 1920 Aircraft



One section of the Seventy-first Regiment Armory at New York, which houses the year's exhibition of the Manufacturers' Aircraft Association



The mounting of the 37-mm. cannon firing 20 shots per minute, on the K Wright-Hispano engine. This shows the breech of the gun and the rear of the engine. The barrel goes forward through the engine and propeller. This is an adaptation of a French idea used by a few of the leading French fliers

radial engine that is stationary and air-cooled, the Anzani listed for a model of the Ordnance, and the Beecher, eight-cylinder, opposed stationary, air-cooled plant, already mentioned.

Some wonder was expressed that the American manufacturers had scarcely touched the air-cooled and the radial and rotary types. Nothing was shown to match the outpouring of such machines that marked the recent Paris exhibition. Some pilots spoke of the more or less fixity of the American type of engine in deprecatory tones, while others seemed to think this factor was good, explaining that the European makers had seen the advantages of the stationary, water-cooled engine, and were powering many of their larger planes with it, giving up the other types. The development of the automobile engine was said by some to supplement the experience of aircraft manufacturers in believing the American practice to be the more valuable.

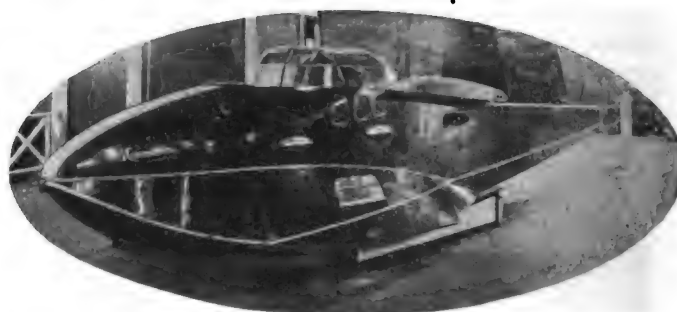
However, it cannot be said that this problem is much nearer a solution, for America, at least, than it was a year ago. Most of the plane makers have been so thoroughly occupied with the problem of getting into peacetime construction, of seeing their way ahead commercially and even of continuing in business, in some cases, that they have had little opportunity to experiment with radical departures from their war construction. They have redesigned fuselages and nacelles, powered their engines higher and enlarged wing surfaces to make their planes of greater commercial value, but basic principles—such as engine type—remain much the same.

This may not continue during the coming year, as some talk was heard of pending changes and of engine experiments that may be made. Goodyear, for instance, may have within a month or so a new "baby blimp," using one of the Lawrence three-cylinder engines. But it was not understood the Goodyear has deserted the water-cooled engine, such as was used on the bag shown here, and the change is not necessarily permanent.

From this, it may be inferred that the American makers are evolving a more or less standardized type of plane, characteristics in most instances being similar. That is true to a certain extent. Some of the exhibits seemed so much alike, except, perhaps, in fittings, that

the manufacturers' names might have been switched and few of the visitors would have known who was the maker. Others, of course, were distinctive, discounting the variety of models.

But, whatever may be said in that connection, it was shown that American makers have developed planes in keeping with the idea of capable construction. Few, if any, of the machines will fail to fulfill the tasks for which they are built. This may not be for speed, or for exceptionally long flights, considering only the ones on exhibition, but they may be expected to meet the needs, with a minimum of loss and accident, of the commercial pursuits to which they should be put. Spectacular appearance and



An Aeromarine hull, the two passengers being seated in the enclosed space while the pilot is outside in the front

spectacular performance, it seems, have not been the goal sought after; rather, it might be said, the effort has been made to obtain a plane that could command continuing markets.

That is another way of saying that war purposes were little in evidence, although the Army and Navy both had interesting exhibits of radio, telephone and similar equipment. The tone of the show was commercial. The war has ended and the makers are facing the problem of doing business on a peace-time basis; at least, they are endeavoring to continue their operations. It is true that some of the plants are yet depending largely upon Government orders, such as overhauling Army DeHavilands, or building for the postal service, but some of them believe the way is clear for a simon pure commercial future, the plants being devoted to the construction of machines for sale to private firms and individuals. Some dissatisfaction was expressed by the delay of the Federal Government in determining its attitude in regard to civil aviation, but other companies, notably one of the largest, expressed itself, through its sales manager, as being entirely satisfied with the outlook.

The Curtiss Exhibit

CURTISS featured the same models that were on exhibit at the recent Chicago show, including the Eagle, Oriole, Seagull and Standard, the only change being that the Eagle has become a two-engined, instead of a three-engined machine, and enlarged so that its carrying capacity has been increased from eight to ten passengers. The machine otherwise has been refined and stands today, according to the makers, as being more reliable me-

New Models at the New York Aircraft Show

Upper—The L-W-F mail freighter and the diminutive monoplane. Center—The re-designed Curtiss "Eagle," having two instead of three engines; showing also at the right the new C-12 engine. Lower—Sport plane of the Ordnance Engineering Corp.

chanically and, through the enlargement of the cabin space, offering greater opportunities for commercial service. An interesting phase of the Eagle development was the recent statement from the Curtiss sales force that maximum production of this machine was assured for 1920 through orders already booked and that the big plane was being built at a rate of one monthly.

The change to two engines has been made by eliminating the powerplant in the fuselage nose, which is used for carrying baggage, mounting the new C-12 V-type engines, rated at 400 hp. on either side of the monocoque body. Other changes principally involved the fittings and refinements of the cabin. The Eagle, as it now stands, has an empty weight of 5310 lb., with a useful load of 3380 lb., distributed as follows: fuel 1600 lb., oil 180 lb., pilot and passengers 1600 lb. The original Eagle, which was described in AUTOMOTIVE INDUSTRIES of Jan. 22, 1920, had a total weight, including fuel and passengers, of 7450 lb., contrasting with 8890 lb. for the present model. The maximum speed likewise has been increased from 107 m.p.h. to a rated speed of 124.5 m.p.h.

The larger carrying capacity also has made necessary an enlargement of the machine itself, the present dimensions giving it a wing-spread of 64 ft. 4 in., a length of 56 ft. 7¼ in. and a height of 12 ft. 11 in. This machine, although surpassed in size by others, was fitted for larger passenger-carrying capacity than any of the others shown.

The remainder of the Curtiss machines were those described in the issue of Jan. 22, 1920. An additional exhibit was a model of the wind tunnel recently erected by the company for experimental purposes. Photographs of it were shown in the issue of Feb. 26, 1920.

Thomas-Morse Mail Plane

SEVERAL interesting features marked the mail plane shown by the Thomas-Morse Aircraft Corp. These were the double engine mounting, the seating arrangements for the pilots, the ratio of useful load to the weight of the plane itself and the construction of the frame work. Like the L-W-F freighter, the Thomas-Morse craft, which is a biplane, has a center nacelle and twin fuselages, but of different design; it mounts its two engines in the center nacelle, one in front and one in rear. The pilots, having dual control, sit in the two fuselages, the nacelle being given over to the engines, which are Wright-Hispano engines rated at 300 hp. each, and to freight compartments.

The ratio of loading is such that the weight of plane empty is 2890 lb., the useful load being 2610 lb., almost the weight of the machine itself. This high carrying capacity was made possible, it was claimed, by careful building up of the frame work with laminated wood. The framework throughout is laminated wood built up to a strength which gives a factor of safety of six. A cross-section of the wing is more nearly like the cross section of the wing of a bird than that of any other craft. It is thick at the front like the wing bone and tapers toward the rear. The foundation of the trailing edge is a wire stretched across the spar tips. The wing fabric is over the wire.

Every part of the plane is streamlined. The only exposed wires are those used for bracing between the planes. The control wires except those to the ailerons are inside the fuselages. There are two complete control systems—one in each fuselage.

In flight tests, the plane has demonstrated that it will stay in the air without losing altitude with only one engine running. The wing spread is 45 ft. 6 in., the wing depth 8 ft. 10 in. and the length overall 25 ft. 10 in. The maximum speed is 130 m.p.h.

Four of these machines are being assembled for the aerial mail service.

The Ordnance Four-Seater

A FOUR-PASSENGER biplane, fitting an Hispano-Suiza American-built engine rated at 150 hp., was shown by the Ordnance Engineering Co., designed, of course, for commercial work. The seating arrangement, which, perhaps, was one of its chief features, placed two passengers in the forward cockpit, protected by an automobile-type windshield, with the pilot and a companion in the rear cockpit, the controls there being dual. This fitting of dual controls was shown by many of the makers and seems to be a fixture on the larger type planes.

The wing span of the plane is 38 ft. and the length 24 ft. 10 in., the wing area being 355 sq. ft. The loaded weight was placed at 2300 lb., the allowance for passengers, baggage and a full load of 250 lb. of fuel being 955 lb. With this loading, the plane has a cruising radius of 290 miles at a speed of 90 m.p.h. The machine leaves the ground after a run of 350 ft. and lands after a run of 300 ft., a minimum speed of 45 m.p.h. was given it. The climbing speed is 5000 ft. in 10 min.

This plane was among the few to be equipped with an electric starter, the generator being placed on the landing gear and operated, of course, by a wind-driven propeller.

L-W-F Machines

POPULAR interest centered largely about the exhibit of the L-W-F Engineering Co. as it showed both the smallest and the largest planes in the hall. The former was a single-passenger monoplane, called the Model L Butterfly sport plane, with a wing span of 29 ft. 6 in., height of 5 ft. 10 in., length of 19 ft. and an empty weight of 595 lb., the loaded weight being placed at 918 lb. The machine was equipped with a 72 hp. Cato engine, having two horizontally opposed cylinders, air-cooled and with valves in the head. It was the only engine of its kind shown, both as to the method of cooling, the number of cylinders and their placing. The makers claim for the machine, as a result of recent tests, that it has a maximum horizontal flight speed of 72 m.p.h., with the ability of climbing 4800 ft. in 10 min. Flying under full throttle, it was rated as having a cruising radius of approximately 6 hr.

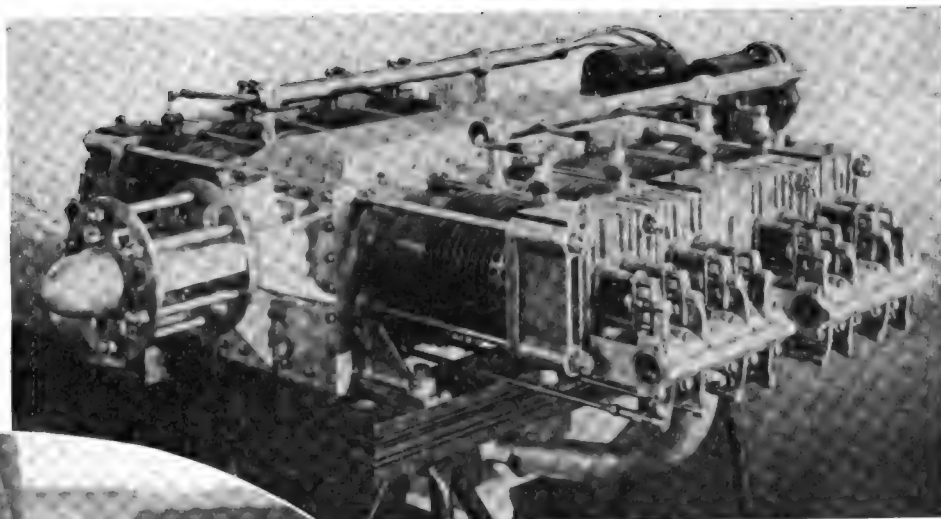
The second machine was announced as being the largest freighter in America and one of the largest yet built. It was designed primarily for the aerial mail service and was rushed to the show without having had a trial flight. It has a wing spread of 105 ft., being of biplane construction, and an overall length of nearly 54 ft. The design is of the twin fuselage and center nacelle type, with three 400 hp. Liberty engines, one being mounted in each of the noses of the fuselages and nacelles. The machine loaded was designed to weigh 20,000 lb. and has a mail carrying capacity of 3000 lb. on long distance flights or double that amount on smaller trips.

The crew and controls are located in the nacelle while the two fuselages, constructed of laminated wood, carry part of the fuel supply and the freight load. Four persons are designated as the crew, these being two pilots, a radio operator and a mechanic. At the maximum speed of 110 m.p.h., it is rated to remain in the air for 10 hr. or 16 at low speed. Climbing ability with full load is claimed if only two of its engines are working and it is designed to land at a speed of 56 m.p.h.

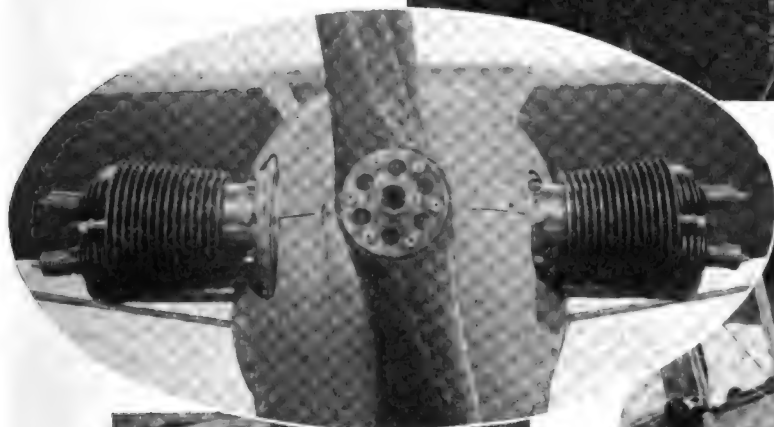
Among the features that identify the machine are the monocoque fuselage and nacelle, the intercommunicating

(Continued on page 653)

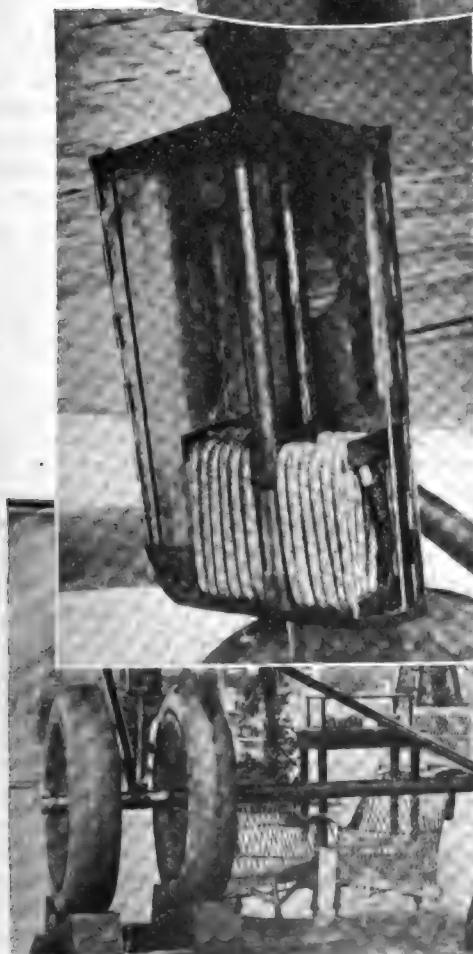
Mechanical
Details
from
the
Aircraft
Show



*Above—The Beecher engine, with
the Cato engine to the left*



*Mounting of one of the two engines on the Thomas-
Morse mail plane*



Landing gear of the L-W-F freighter, showing above a detail of the shock absorber

Belgian Factories Recover from the German Invasion

Mr. Bradley, returning from a lengthy trip through the automotive plants of that country, depicts vividly how they have overcome the effects of the war and returned industriously to work. He shows the various difficulties being surmounted by the little country and predicts the Belgians will be the first people of Europe to get over the hostilities.

By W. F. Brad'ey*

Brussels, Feb. 20, 1920.

WITHIN three months of the present date most of the leading Belgian automobile manufacturers will be in production on a basis equal to that of 1914. Some, however, will not be so fortunate, but this is a wonderful result entirely to the credit of Belgian manufacturers, who appear likely to be the first among the Europeans to recover from the war.

When the Germans went out of Belgium in November, 1918, they had stripped every factory of machinery and tools but, except in a few cases, the buildings were intact. The task of getting back into production was exceedingly difficult, for not only had raw material to be secured but machinery also had to be purchased. The difficulties have increased and not decreased since the Armistice. Progress is not general all along the line. While some factories are fully tooled up and are beginning to produce, others are in practically no better condition than when the Germans left them, and a few probably will drop out of the automobile industry altogether.

As a general rule, when manufacturers took the initiative and began reconstruction without waiting for the assistance of the Government, they have made wonderful progress. Where official help has been relied on, the factories are in a backward state. Indemnities for losses incurred during the war, either by German or Belgian military action, have not been paid uniformly. Some of the smaller firms, most in need of this assistance, state that they have not received a cent. Some of the bigger firms have been given an indemnity or are on the point of receiving it.

The first action of the Belgian Government on securing possession of their country was to distribute to the automobile factories Belgian and German army automobiles and trucks for repair. This was intended

as a temporary measure in order to keep men employed while plants were being gotten together for production. Such leading factories as Minerva, F. N., Metallurgique and Excelsior have abandoned repair work and are into car construction. Many of the smaller firms, however, are still doing repair work. This is a bad sign. It means that the factories have not been able to get together plant and workers necessary for a resumption of their normal activities. The bigger factories having abandoned the repair of army vehicles, dealers are taking up this work. Having nothing to sell, for the home factories have produced nothing and importation has been difficult, this was an excellent opportunity for them.

The first action of enterprising Belgian manufacturers, after the signing of the Armistice, was to proceed to Germany in order to get possession of the machinery and plant that had been seized by the German military authorities. Generally the caretakers who had been left in charge of the Belgian factories discovered, by contact with German soldiers, to which factory each piece of machinery was being sent. This facilitated search, for it enabled the heads of departments to go direct to the German factories and identify their own machines. Frequently the Germans denied having possession of the machines claimed but, when a search was insisted on, they had to admit possession. When the Allied Commission got into Germany, they found that the research work had been done for them, in many cases, and only a signature was required to have the stolen machinery shipped back to Belgium. This machinery was not in good condition. Much of it had been modified for shell turning and in every case it had been roughly handled. Some of it cannot be employed again until extensive repairs have been carried out.

Four months after the Armistice an agreement was arrived at between the Belgian and the American

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Governments, whereby the latter undertook to supply surplus machinery on advantageous terms. This machinery is now coming through regularly and is being delivered to the automobile factories and to the general engineering establishments. Shipments are made to Antwerp and from there it is distributed by rail to different parts of Belgium.

Some of this machinery is new but none of it has had more than slight service. It is all surplus American war stock and is sold at 50 per cent increase on 1914 list prices, plus 5 per cent for shipping and insurance. Credit of five years' duration is given, but this may be renewed for other periods of five years, relieving the Belgian manufacturer of immediate anxiety regarding the high rate of exchange. The detailed distribution of this machinery is in the hands of a private co-operative society, known as La Construction Métallique. In addition to acting as distributing agent, this body serves as intermediary between buyers and sellers and between manufacturers and clients by distributing information regarding markets and material.

This arrangement has been of immense value to Belgian manufacturers in enabling them to resume production. Most of them are well satisfied with the scheme. There are a few complaints that the used machinery has not always been in skilled hands and that it needs repairs before it can be put on accurate work. Not all the makers have taken advantage of this organization. Some few had been in a position to place orders direct during the war. A certain number of timid individuals kept out of the plan and are regretting it.

The coal supply of Belgium is good, this industry now being 94 per cent efficient. The steel mills suffered more and are as yet unable to meet home requirements. Practically all the special alloy steels required for the automobile industry have to be brought from abroad. Some of the forge plants are in operation but, until the Belgian steel plants are in production, they will remain dependent on foreign supplies.

Very Little Labor Trouble

The railroads of Belgium are working perfectly and are a striking contrast to those of France, where inefficiency and disorganization exist. Belgium has had comparatively little labor trouble.

Among automobile manufacturers, the opinions vary from slight nervousness to complete satisfaction. Among the Flemish element a certain dissatisfaction is being manifested and at times it is rather hard to maintain cordial relations between employers and workers. Among the Walloons, on the other hand, the labor situation appears to be more stable. Works managers were met who declared they had never known their men to work so willingly or to produce so much. For the first month after the armistice there was a spirit of laziness, but since then enthusiasm to produce has been the prevailing instinct. The workers of Belgium who remained during the occupation were not spoiled by their German masters; those who went to England and worked there felt that they had been driven out by a usurper and were enthusiastic to return to their own homes. The demoralization which was feared as the result of four years' idleness, has not made itself felt. The cost of living, too, so far as the working classes are concerned, has not increased to the same extent in Belgium as in other Allied countries.

In the engineering trade, it was feared that numbers of Belgians would be tempted to remain in France in order to get advantage of the higher wages prevailing there. This has not been noticeable to any considerable extent. If wages are higher in France, the cost of liv-

ing is also more expensive and in all the manufacturing centers the housing problem is so acute that the Belgian family hesitates to emigrate. Although well received in England, the language and the totally different customs cause that country to be looked upon as foreign and emigration to it is not very common.

Since the Armistice, there has been a break between Belgian automobile manufacturers and dealers. For more than fifteen years the two have been united in one organization. But, since the home manufacturers have been unable to produce, interests have been divided and after a strained period the two groups have formed separate organizations. Belgium is the only country in Europe which has maintained her pre-war import duties on automobiles. These are based on weight, but are practically equivalent to an increase of 6 to 7 per cent on the value of the goods.

There being a great shortage of automobiles, which the home manufacturers could not meet, dealers naturally took up foreign representation. At least a score of American makers are now represented on the Belgian market and American cars are to be found everywhere.

Importation of American Cars

The importation of American cars had only just begun on an important scale when the exchange began to rise. With the dollar standing between 14 and 15 francs, or nearly three times its normal value, it is difficult indeed to do business with the United States. As an example of the disturbing influence, a Ford costs about 14,000 francs. American cars are still being sold but their cost is so high that, whenever possible, clients are holding back until Belgian cars get on the market. England has provided nothing, for not only was her exchange adverse but she was unable to deliver. France has done a little business, but the great difficulty here has been deliveries. A year ago Citroen took orders by the thousands. But, because of strikes and other reasons, he was unable to make deliveries and some unpleasant scenes were witnessed between clients and the Belgian dealers for this firm. Notwithstanding, Citroen is the foreign car seen in the greatest number in Belgium.

An attempt is being made to get German cars into Belgium. The low value of the mark and the moderate import duty makes this attractive but the number of such imports is limited by reason of the difficulties German firms appear to be having in making deliveries.

Belgian manufacturers are paying no attention to the agricultural tractor. As a consequence, this field is being left entirely to foreign makers. It is claimed that the demand is too small to justify the construction of such machines in Belgium. Farms are of small area and a tractor can only be used economically on a co-operative basis. Despite this, an agricultural tractor demonstration was held during the past year and two are promised for the present year, one being for machines consuming palm oil and evidently intended for the Belgian Congo.

The Belgian automobile firm which is most advanced is Minerva at Antwerp. This company had certain advantages over the others by reason of the fact that the directors left Belgium when Antwerp fell and were able to place orders in America and in England while the war was in progress. Machinery was thus ready to be shipped into Belgium as soon as that country was freed from German domination. Minerva is now working with a staff of 2000 and has begun deliveries on a four-cylinder Knight-engined car designed during the war. A six-cylinder model, also with the Knight engine, is being prepared and will be in production next May.

Although the Minerva company is the most advanced of all the Belgian factories, they have met with tremen-

dous difficulties during the past few months. In order to get into rapid production, arrangements had to be made for many supplies to come from outside. Belgium had only one important frame-producing plant and this was entirely destroyed when the Germans sacked Louvain. In consequence, Minerva placed orders in America for frames. Other orders were placed for ball bearings, forgings, gears, etc. The complaint is made by the director of this company that American firms accepted orders and made delivery dates which they have not at all lived up to. In an interview, the names of many leading American manufacturers of components were quoted, the dates being given for deliveries, many of which were six months behind time. This has created a bad impression. It is admitted that America may have her own difficulties, but it is claimed that orders should not have been accepted if there was no possibility of delivery. As the result of these delays, Minerva is more backward than would have been the case if supplies had been received in time. Practically similar treatment was received in England, where orders were accepted and delivery dates not lived up to as promised. It was impossible to get anything at all from France.

The Unfavorable Exchange Rate

In addition to these difficulties, Belgium had to fight the last few months against adverse exchange rates. With the dollar at 15 francs, it is practically impossible to purchase from America. Minerva gives a typical instance of the effect of the increase in exchange rates and rising prices in America. During the war, special bevel gears were ordered at \$13 and at that time the dollar could be purchased at 5.70 frs. A few weeks ago the same spiral bevel sets cost \$53, and the dollar was worth 15 frs. This is an increase of 1202 per cent!

Although in regard to labor Belgium is much better off than neighboring countries, Minerva was not altogether satisfied. It was stated there that there was discontent among the workers and repeated threats of strikes. The Minerva company has had two or three disputes. These have not all turned out to the advantage of the strikers. On one occasion the workers went back to the old terms and paid 5 per cent of their earnings into a general fund as a guarantee against further disturbances. This is a remarkable result, in view of the general tendency of the European labor market.

The Metallurgique company has been able to produce 200 cars since the armistice and expects to run up to 800 during the present year, this being more than equal to the 1914 output. During the German occupation, this factory was used by the army for repair work. The stocks of spare parts, therefore, were left untouched except when required for vehicles in service in the German army. All the machinery was taken away and has had to be replaced since the armistice. It is because of the spare parts in stock that this firm was able to produce during 1919.

The F. N. company, which is Belgium's leading small-arms concern, has been slower in getting into production. This factory, which is one of the finest of its kind in Belgium, was stripped almost completely, the only machinery left behind being that required by the Germans for the repair of their trucks. This machinery was put into the automobile section of the factory in order to get that branch into production as quickly as possible. At present, arrangements have been completed for producing 15,000 motorcycles during 1920. Three types of touring cars will be built but probably it will be six months before production has risen to the pre-war scale.

Excelsior lost everything, but the engineers who remained in Belgium during the occupation devoted all

their time in getting out new designs. They even built an experimental car during the German occupation, but, of course, could not put it on the road. Since the armistice, machinery has been secured and the new models have been put into production. As a beginning, a modified type of pre-war chassis is being produced, but gradually this will give way to an entirely new type. Excelsior has completed much interesting experimental work. The new model is a six-cylinder with valves in the head. The construction is original, for the cylinder-head and the entire water-jacket form an aluminum casting mounted on the cylinder barrels. That type of construction gives the advantage of the detachable cylinder head without any of its inconveniences, as there is no danger of gas or water leakage at the head. The cylinder barrels are separate and in case of a scored or ovalized cylinder any one can be changed at slight cost. All Excelsior cars are fitted with four wheel brakes, to the exclusion of the transmission brake. These are the Adex type, patented by the Excelsior company, and operate diagonally by the use of one pedal. The braking effort is always uniform between a front and a rear wheel on opposite sides.

Patents have been secured for a flexible coupling between the flywheel and the clutch. In this construction the cone clutch member is connected to the flywheel by means of six studs mounted in rubber sockets. This gives a cushioning effect between engine and transmission and prevents all chatter in the universal, or in the gears, even when throttled down and a cylinder is misfiring. The gearbox on the new cars is at the front end of the tube enclosing the propeller shaft and is attached to a heavy cross frame member by means of yokes with provision for taking up lateral play.

Rear cantilever suspension has been adopted, with the adjunction of the patented Adex stabilizer. This is a pivoted parallelogram, uniting the center of the axle housing to the frame members. By this device all the advantages of cantilever springs are obtained without any of their inconveniences. Tests on the road show that even when taking corners at very high speed there is no tendency for the rear end of the chassis to swing outward. The rear tracks with the front in a most remarkable manner, giving a sense of security when cornering at speed quite unusual with cantilever springs.

Lack Frame Members

The Pipe company at Brussels has not yet gotten into production on automobiles, but is continuing on army truck repairs. Owing to the difficulties met with, this firm has decided that its first activity will be the building of machine tools. When this business is established, automobile construction will be taken up.

Sava, at Antwerp, is in a backward condition. This firm was robbed of its machinery only a few days before the Armistice and has not gotten much of it back from Germany. Army trucks are being repaired, but construction of a sporting type chassis will begin shortly.

Belgian manufacturers have been much handicapped for lack of frame members. The only plant of any importance, that of the Dyle & Bacalan company, was wiped out of existence when Louvain was sacked. Attempts were made to get frames from America, with great disappointment on the matter of deliveries. To meet the most urgent requirements, frames have been made up by hand, irrespective of cost. Dyle & Bacalan have rebuilt and will be in production within two months.

The most important steel forming and stamping plant in Belgium is that of the Derihon Bros., near Liège. This was stripped absolutely bare, but, within two or three days after the signing of the Armistice, one of the Derihon brothers was in Germany searching for his ma-

chinery. Such vigorous action was taken that by June, 1919, the requisitioned machinery was back at the factory and by August the works were in production.

This firm is producing as much as before the war. All the old machines have been replaced, but new ones are on order, and as each one arrives it replaces an old one. Before the war the Derihon Bros. secured their steel from Germany. All connection with that country has been severed, the special alloy steels being obtained from Sheffield, England, and the ordinary steels from Belgian firms. Derihon has made a specialty of stampings and forgings for automobile construction, his BND steel having become world-famous. The firm is exporting and has supplied all the special forgings for the French cars now building for the Indianapolis race. The labor situation at this factory is declared to be excellent. The men are paid a fixed wage and a premium for excess production. They are said to be producing more than before the war. The French factory of Derihon is not yet in production.

Van den Plas, the most famous of Belgian body builders, is at work with a staff of 650 and is producing nine high-class bodies per week. Many of these are exported to France to be fitted to French chassis in that country.

The first Belgian automobile show will be incorporated

with the Olympic games to be held at Antwerp in May and June. It is intended, however, to have a purely automobile show in December in the Palais du Cinquantenaire, Brussels, which has become free from military control. Probably the really new post-war types will be held back until that exhibition. Among the novelties promised are a 12-cylinder Excelsior and a rotary valve Metallurgique.

Belgian manufacturers are making no attempt to get into the cheap car class. Their intention is to keep in the high-grade class for both home and foreign business. Manufacturers generally are not disturbed by the invasion of American cars. They consider that the cheap American cars will only add new recruits to motordom, and they are convinced that they can build cheaper than the better class American makers. Although the high rate of exchange is hitting them hard in the purchase of machinery and supplies, it is a most effective protection against the invasion of their market by American automobile manufacturers. Belgium is importing heavily from America on all kinds of goods, the value of the imports for the first nine months of 1919 being \$283,417,698, equivalent to \$37 per head of population. With the vigorous revival of Belgian industries, this amount should decrease very shortly.

Aircraft Makers Exhibit the 1920 Commercial Model

(Continued from page 648)

gasoline and the fire extinguisher systems. The wing construction is of the Pratt truss type and consists of three upper and three lower panels of 11 ft. chord and equal spans with a gap of 11 ft. Each wing is equipped with balanced interchangeable ailerons. Ribs are built up first and then slipped over the beams, which are built up of four pieces, thus forming a hollow box section; the top and bottom are of spruce and the sides of birch. The internal wire bracing is double, of No. 8 solid piano wire and 3/16-in. hard cable. All external wire fittings are applied directly to the beams and project through the covering.

The fuselages and nacelle are supported between the upper and lower planes on tubular struts thoroughly streamlined. A 12-cylinder high-compression Liberty engine drives three upper and three lower panels of 11 ft. chord and the nacelle, each engine driving a tractor propeller. The main load and crew are carried in the nacelle while each fuselage carries its complete power plant and has a small auxiliary compartment for excess mail or cargo.

Each power plant is complete within its respective fuselage or nacelle and consists of a 12-cylinder Liberty engine equipped with Splitdorf ignition, electric starters and compression release. The radiators are above the motors, directly in the blast of the propeller and equipped with individual shutter controls.

The tail is of the biplane type, attached to the rear end of the two fuselages. It consists of two double cambered horizontal stabilizer planes superimposed, with elevators attached and a fin on the top of each fuselage followed by a balanced rudder. A third balanced rudder is installed midway between the two.

The landing gear is of the six-wheel, two-axle type, with the outer two wheels side by side directly under the center of each fuselage and the other two wheels spaced equally between. The landing gear is so placed that when landing the center of gravity falls sufficiently far back of the wheels to prevent any tendency to nose over.

The Goodyear Blimp

THE Goodyear company exhibited the pony blimp shown at Chicago and previously described in this publication. Interest in it, from the development standpoint, centered around the recent announcement that the craft had been sold to a transportation company at Kansas City, Mo., where it would be used for various kinds of work. Goodyear, it was said, was working upon new machines and a model was promised within a few weeks.

The Dayton-Wright Models

NO changes have been made in the cabin cruiser and coupé models of the Dayton-Wright Division of the General Motors Corp. The two machines—the KT and the OW—were shown at Chicago and were described in AUTOMOTIVE INDUSTRIES of Jan. 22, 1920.

The West Virginia

THE West Virginia Aircraft Co. exhibited a three-seater tractor plane, with an upper wing span of 44 ft. 5 3/8 in. and a lower wing span of 34 ft. 9 3/4 in. The gap between the wings is 61 1/4 in. It is 27 ft. 1/8 in. long and 9 ft. 9 in. high. Empty, the plane weighs 1700 lb. The gross weight of machine and load is 2400 lb., the useful load being 700 lb., distributed as follows: Fuel 133 lb., oil 40 lb., pilot 165 lb., passengers 362 lb.

The motor is an American-built Hispano-Suiza 8-cylinder water-cooled type. Its rated horsepower at 1400 r.p.m. is 150. The weight per horsepower is 2.88 lb.

The machine has a speed of 77 m.p.h. and in minimum horizontal flight 40 m.p.h. It can climb to a height of 4000 ft. in 10 min. The maximum range at economic speed is about 150 miles. The standard equipment consists of a tachometer, oil gauge, gasoline gauge, clock and altimeter.

Exhibit of Tractor Equipment Shows Improvement and Advance of Industry

Much of the space at Kansas City was given over to the display of new parts and accessories which Mr. Heldt describes herewith. Engines, transmissions, steering gears, radiators, spark plugs, steels and castings, seats, safety devices, pulleys and dynamometers are included.

By P. M. Heldt

A CONSIDERABLE portion of the space at the Kansas City Tractor Show was given over to exhibits of tractor components, accessories and supplies. Altogether there were about one hundred exhibitors in this class. The principal ones showed engines, clutches, transmissions, steering gears, wheels, ball and roller bearings, carbureters, magnetos, spark plugs, radiators, fans, oilers, air-washers, piston rings, mufflers, castings, forgings and bearing materials.

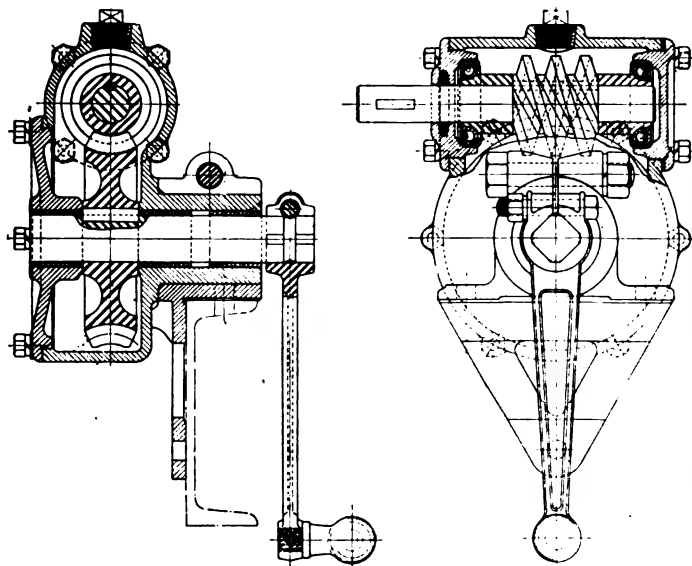
Most comprehensive was the exhibit of tractor engines, of which no less than fourteen makes were shown, not counting one that was not exhibited by its manufacturer and not with the object of closing sales contracts for engines. The newest design among these engines is the W-S-M, designed by Joseph Van Blerck, a well-known marine engine designer, to which a special article will be devoted. The Waukesha Motor Co., which has long been specializing on tractor engines, has brought out a complete new line in five sizes, which is based somewhat on the Class B engine of the Quartermaster Corps. The engines exhibited by the different firms cover a range of sizes suitable for 2- to 4-plow tractors, with the exception of the Le Roi, which is used largely on motor cultivators. This is a 4-cylinder engine, with $3\frac{1}{8} \times 4\frac{1}{2}$ -in. cylinders.

Of transmission exhibits, there were only two, the Nuttall and Foote, both showing models combining the change gear, final drive and rear axle in one unit. The Nuttall

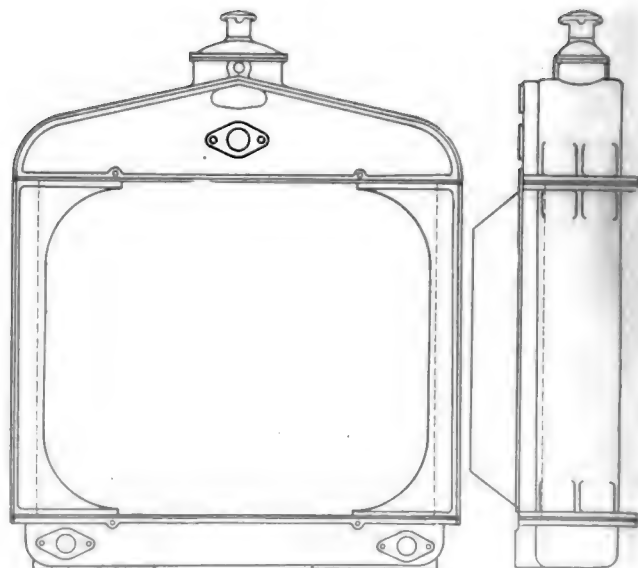
company had an electric furnace installed at the show and gave demonstrations of the effect of heat treatment of steel. Samples of heat-treated and untreated steel were broken and the effect of heat treatment was brought out in the difference of the grain. Sclerometer tests were also made.

This company also exhibited what is claimed to be the first steering gear specially designed for tractor work. It is of the worm and complete wheel type, and sections of the gear are shown herewith. The steering column can be placed at any angle with relation to the frame, so as to permit of the proper location of the steering wheel. The housing is cast with a bracket for fastening it to the frame. By reversing the worm shaft a left-hand unit can be made of the gear. The worm is cut from machine steel and the wheel of drop-forged steel, while the casing is of cast iron. The steering arm is a drop forging and is provided with a separate drop-forged, heat-treated ball end. The worm shaft is carried on combined radial and thrust ball bearings.

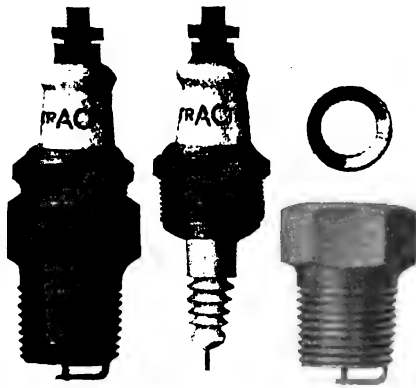
An endeavor to standardize tractor radiators is being made by the McCord Mfg. Co. The advantage accruing to the tractor manufacturer would be that he would save all tool and pattern charges. An outline drawing of the radiator is shown herewith. It is made in three sizes—small, medium and large—measuring 23, 28 and 33 in. in overall width, respectively. Further variation in capac-



Sectional views of Nuttall tractor steering gear



Two views of the McCord tractor radiator

*A. C. tractor spark plug**Adjustable spring seat**American wrought steel pulley*

ity is secured by changing the depth of the core, as well as by varying the height of the side members, from 17¼ to 35½ in. The radiator is of the finned tubular type, made in five parts—top and bottom cast tanks, two cast side pieces, or spacers, and the core. Head sheets of No. 20 gage stock are provided on the core, which are bolted to the cast-iron frame.

Special Tractor Spark Plug

A special tractor spark plug has been brought out by the A. C. Spark Plug Co., of Flint, Mich. The regular A. C. plug is a one-piece, non-detachable plug, but it is figured that in kerosene-burning tractor engines it is necessary to have the insulator core removable for purposes of cleaning. There are many spark plugs on the market which can be taken apart for cleaning, the insulator being clamped between the shell and gland nut. Unfortunately the tractor operator, in taking the plug apart and putting it together again, is usually not very careful, and if he puts too much pressure on the porcelain he is apt to crack it. To obviate this difficulty in the A. C., the porcelain is spun into the gland nut and this assembly is screwed into the shell against a tapered seat on which there is a copper-asbestos gasket. It is obvious that the force with which the gland nut is screwed home does not affect the pressure on the porcelain.

There is also a special feature in the design of the porcelain. This is formed with a number of sharp edges, or circular ridges, near its inner end, and these edges are supposed to get so hot in operation as to burn off any carbon that happens to form on them, thus preventing the formation of a continuous leakage path.

Steel Castings

Manganese steel is a material of great resistance to abrasive wear, and as such has found application in farm tractors. During the war it was used for the chain tracks of artillery "tanks" and previously it was used for rails of street car lines where short curves have to be described and where the wear naturally is heavy. The Taylor-Wharton Iron & Steel Co. exhibited various sample castings of manganese steel for tractors, which are marketed under the trade name, "Tisco." For crawler-type tractors this steel is recommended for shoes, links, pins, lugs, grouser, spacing blocks, sprockets, chains, rollers and gears, and for wheel-type tractors for bull gears, pinions and sprockets.

Steel castings for automotive parts were exhibited by the Hubbard Steel Foundry Co. In the past automotive engineers have been rather averse to the use of steel castings, especially for parts that require a large amount of machine work done upon them, as it will happen that when the machining is nearly done a blow-hole is struck, which makes it necessary to scrap the whole piece. The

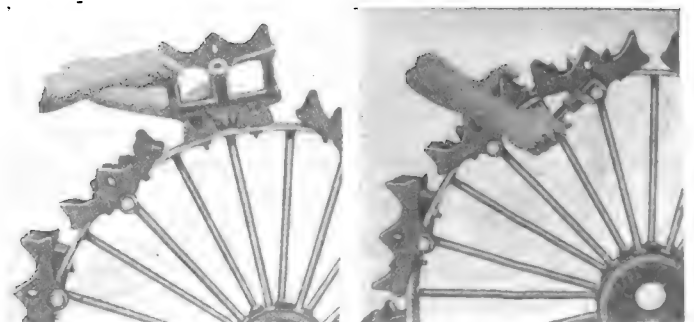
Hubbard company claims to have overcome this. Since the war this concern has been engaged in research work, which has enabled it to materially improve its product. To prevent the formation of blow-holes, use is made of ferroaluminum. This alloy is broken up and placed in the bottom of the ladle and, when the molten steel is then poured into the ladle, the ferroaluminum will melt and the aluminum will combine with the oxygen combined with the steel, thus preventing blow-holes. One of the important parts specialized by the Hubbard company is rear axle housings for trucks and tractors. In order to overcome the objection of waste due to blow-holes, the concern offers to make an adjustment on machining cost. From 2000 to 5000 tons of steel are poured each month.

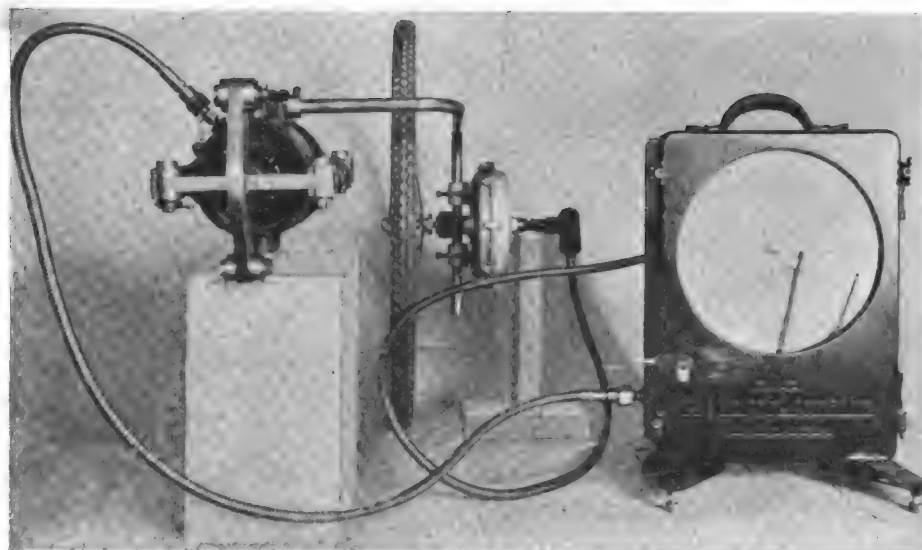
Cushioned Seats

The need for more comfort for the operators seems to be generally recognized, and some of the newer tractors are fitted with upholstered seats and with seat backs. Then, a good many tractor seats are so arranged that the operator can swing them out of the way when he gets tired sitting on them and stand on the platform for a while. A new seat was exhibited by the Adjustable Spring Seat Co. It consists of a pressed steel, or agricultural type of seat, supported on eight coiled springs. Six of the eight springs can be removed easily and in this way the seat adjusted to the weight of the operator. The springs are said to work best when carrying a load of about 30 lb. each, so, for a driver weighing about 180 lb., six springs should be used and the other two removed.

A new form of tractor traction device was exhibited by the Grid-Iron Grip Co. About twelve of these grips are used per wheel. Each consists of a base bolted to the wheel rim and a swiveling rocking lug pivoted on the base. The grids are made of electric steel and are said to be very durable. They can be attached to any wheel. A saving in power is claimed because, with these swiveling grids the wheel does not roll up a ridge in front of it.

A safety device for tractors, intended to prevent injury to the engine when the oil supply in the crankcase

*Method of attaching Grid-Iron grips*



The Szekely dynamometer

runs low (in engines with splash lubrication) was exhibited by the Cleveland Automatic Cut-Off Co. It consists of a steel barrel, or reservoir, containing a cork float securely fastened to a steel rod. This rod extends through the top of the barrel and is fitted with a brass cap. The device is attached to the oiling system of the motor. As long as the oil is at the proper level in the crankcase and the oiling system is working properly, the float stays up, but the moment the oil gets too low in the crankcase for the oiling system to function properly, the float sinks, and as it is connected with the ground wire of the magneto, ignition is cut off and the engine stops.

The American Pulley Co. showed wrought steel belt pulleys suitable for tractor use. These have a triangular center secured to a cast-iron hub. The pulleys are made in sizes varying from 8 to 14 in. in diameter, 15/16 to 3 1/2 in. in bore, and 2 to 8 in. in width of face. Probably the greatest advantage is the low weight.

New Traction Dynamometer

The O. E. Szekely Co. has developed a traction dynamometer, and will manufacture same for the market. The outfit comprises three elements—a hydrostatic ram, a speed reduction mechanism and a recording gage. By means of this instrument it is possible to measure the total distance traveled in a tractor test, the speed, or distance traveled per minute, the total drawbar pull in pounds, and the work done in foot-pounds per minute.

The hydrostatic unit consists of a cast-iron cylinder with piston, both parts being made of a fine grade of cast iron containing 20 per cent steel. Within the cylinder behind the piston or ram there are two overlapping leather cups containing the oil. These are of the dual seal type, with a spring wire pressing the inner cup against the outer, and thus preventing leakage. To prevent surging of the oil due to sudden changes in draft, a spring set-ball check is inserted in the line to the gage, provided with means of adjustment in the form of a plunger increasing or decreasing the spring pressure.

The pressure gage is of the Bourdon tube type and is direct-acting, all pivots and trunnions having been eliminated in order to prevent the readings being influenced by friction. As the range of pressures to be indicated varies with the size of tractor to be tested, several units will be made. One, for small tractors, has a chart for registering pressures from 0 to 1000 lb.; another, suitable for the general run of 2- and 3-plow tractors, registers from 0 to 3000 lb., and a third set is made with one

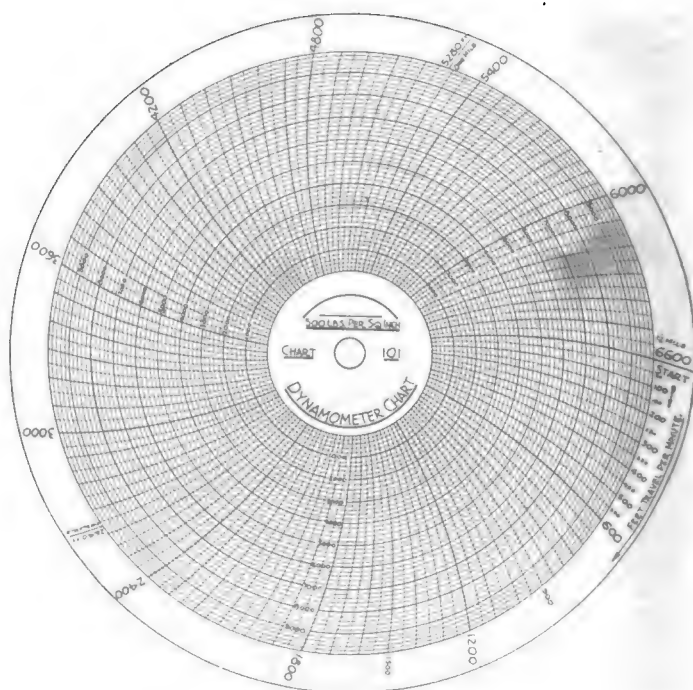
unit for from 0 to 6000 lb. and another for from 0 to 10,000 lb. As already stated the Bourdon tube directly operates the indicator hand scribing the pressure line or draft line upon the chart. The chart is rotated by means of a mechanical device connection to a bicycle type of wheel, which is trailed over the ground by means of an angle rod connection to the hydrostatic unit. In the instruments made so far, the gear reduction has been such that with a tractor speed of 2 1/2 m.p.h. the chart would make one complete revolution in one-half hour, and therefore have traced upon it a line showing the variations of the draft over a distance of 1 1/4 miles. As tractors when used for different purposes vary considerably in speed, it is planned in the future to provide for three different gear reductions in the box, one

giving a half-hour record on the chart with a tractor speed of 2 m.p.h., the second the same at 4 m.p.h., and the third the same at 6 m.p.h.

The Time Element

In addition to pressure and distance traveled, there must be recorded on the chart the elapsed time, and this is accomplished by a clock set in the recording gage housing at the bottom. This clock, by a ratchet wheel, actuates a second hand adapted to scribe a line on the chart just outside the scale circles. As the lever drops off the point of each ratchet tooth a sort of check mark is made on the chart, and the distance apart of adjacent check marks shows the distance traveled in one minute.

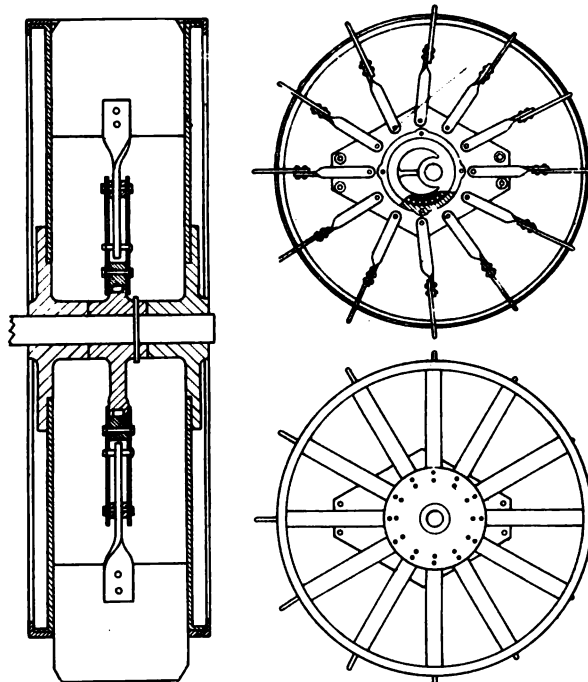
An interesting feature of construction is the tube connecting the hydrostatic unit with the gage. This is a copper tube of 1/16 in. outside diameter, which is formed into a closely wound coil and protected by a steel cable covering. Connections are made at both ends by substantial unions. The bore is only about 1/32 in.



Blank chart for Szekely's tractor dynamometer

Hoosier Spade Wheel

Reference was made in our report of the show, in the issue of Feb. 26, to the Hoosier wheel, but the remark there made that it was similar to the German artillery tractor wheel shown at Ottawa Beach last summer is not quite correct. The German wheel had a mechanism by which the spade lugs could be made to protrude more or less from the wheel rim in accordance with the requirements. In the Hoosier wheel, on the other hand, the spade lugs are combined in an assembly which turns around an axis eccentric to the wheel axis and the arrangement is such that on one side of the wheel the lugs are withdrawn while on the opposite side they protrude from the wheel rim. The eccentric can be swung around the wheel axis so that the lugs will be protruding from the wheel at the bottom and withdrawn at the top, or if no lugs are required, the eccentric may be set to cause the lugs to protrude on top and withdraw at the bottom. It will be understood, of course, that each lug moves in and out once each revolution of the wheel, and this action of the lugs tends to keep the wheel clean. The sectional view herewith shows the construction of the wheel. On the outside of the eccentric there are two sets of two pins and two opposite lugs are arranged with their spokes between one set of these pins, thus determining the position of the eccentric.



Sectional views of the Hoosier spade wheel

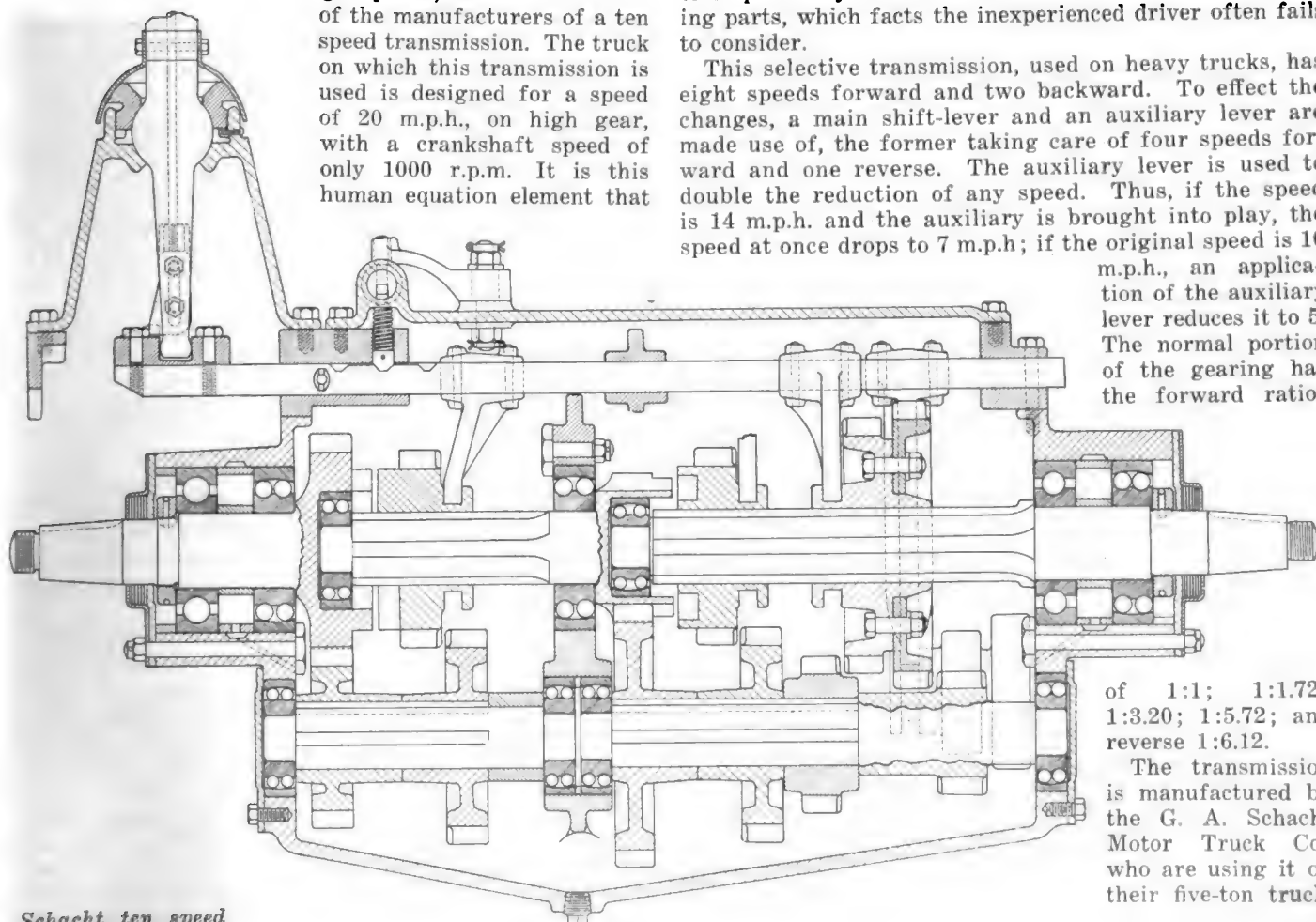
Ten Speed Transmission Truck

THAT there is a natural tendency for a driver to speed a truck, when empty or on good roads, whether or not such a truck is built for high speeds, is the contention of the manufacturers of a ten speed transmission. The truck on which this transmission is used is designed for a speed of 20 m.p.h., on high gear, with a crankshaft speed of only 1000 r.p.m. It is this human equation element that

has induced the makers to provide additional gears, for if an engine is not intended for high speeds, an excessive speed may cause undue vibration or injure the moving parts, which facts the inexperienced driver often fails to consider.

This selective transmission, used on heavy trucks, has eight speeds forward and two backward. To effect the changes, a main shift-lever and an auxiliary lever are made use of, the former taking care of four speeds forward and one reverse. The auxiliary lever is used to double the reduction of any speed. Thus, if the speed is 14 m.p.h. and the auxiliary is brought into play, the speed at once drops to 7 m.p.h; if the original speed is 10

m.p.h., an application of the auxiliary lever reduces it to 5. The normal portion of the gearing has the forward ratios



Schacht ten speed truck transmission

of 1:1; 1:1.72; 1:3.20; 1:5.72; and reverse 1:6.12.

The transmission is manufactured by the G. A. Schacht Motor Truck Co., who are using it on their five-ton truck.

Gear Production and the Method Involved in the Cutting

Accurately proportioned teeth, an economical rate of production and a uniformity of output are among the requirements facing the manufacturer. An explanation is given here of two classes of machines developed for such work, Mr. Trautschold going into detail in describing the process.

By Reginald Trautschold, M.E.

THE involute form, or type, of gear tooth—quite irrespective of its merits or shortcomings—is now the recognized standard for virtually all varieties of externally meshing gears, whether they be of the spur, spiral or worm type, and the problem confronting the manufacturer of cut gears is twofold. First, accurately proportioned gear teeth are essential to secure satisfactory operation of the gearing, and, second, the rate at which gears can be produced must be high in order to reduce the cost of manufacture.

To these two main requirements, however, should be added a third—uniformity of output—though this would appear to be assured if accuracy in reproduction of the involute tooth profile could be realized, for the involute curve is of mathematical exactitude and not susceptible to variation. Unfortunately, a pure involute set of gears cannot be made on the $14\frac{1}{2}$ -deg. system, or even on the 20 deg. system, on account of the unavoidable "involute interference," so the profile of the so-called "standard" form of involute tooth may depart from the involute curve for the greater part of its depth. Uniformity of output, therefore, would appear also to be an essential requirement, for the necessary modification to the involute curve must be standardized as well as the form of the tooth.

Limitations of Involute System

The limitations and inaccuracies of the involute system are due to the fact that in many ordinary gearing combinations the teeth of the respective gears, if of pure involute profile, would interfere, the gears would not mesh and run together on account of advancing teeth meeting obliquely, wedging, and tending to force the engaging teeth out of mesh. In the involute system, a normal from any point on the true involute profile of a tooth is tangent to the base circle of the gear and the path of point of tooth contact throughout the engagement, or line of pressure, is a straight line passing through the instant axis of engaging gears, inclined to the plane of common tangency at an angle customarily referred to as the pressure angle or angle of tooth obliquity. The greater this angle, the freer the combination is from involute interference; that is, by increasing the pressure angle, interference of teeth can be avoided.

It is this peculiarity of the involute system that enables the center distance of engaging gears to be increased somewhat and still maintain proper tooth action, for increasing the center distance of engaging gears is equivalent to increasing their pitch diameters slightly but not the diameters of their respective base circles. The effect is simply to increase the pressure angle, for otherwise, the characteristics of the gear teeth are unaffected. This is

the chief advantage of the involute system of externally meshing gears, for it permits a certain adjustment of center distances without destroying the smoothness of action.

Involute interference varies inversely with the obliquity of the teeth, it is evident, and this is one reason the 20 deg. system has supplanted the $14\frac{1}{2}$ deg. system for certain lines of gearing, in spite of the decreased efficiency in transmission due to the greater axial thrust developed by the heavier pressure angle. This is not the only reason, or the most important, for the frequent adoption of the more oblique tooth, it is true, but it illustrates the logical method of avoiding interference.

Avoiding Interference

Obviously, the avoidance of involute interference by increasing the obliquity of the teeth on the pitch circle can only be carried to a certain degree and the only other way of overcoming the difficulty is to destroy the pure involute curve over such section of the tooth profile as develops interference and to remove the interfering portion of the teeth. Interference will occur whenever a gear combination is such that the point of tangency of the line pressure with the base circle of the pinion lies within the addendum circle of the engaging gear. When such point of tangency falls on or outside the addendum circle of the meshing gear, interference is avoided. It is thus apparent that three factors affect interference, the number of pinion teeth, the speed ratio of the combination and the pressure angle of the teeth. The limitation placed on the involute system of gearing by involute interference, therefore, is a serious one and must bear considerable weight on economical production.

The factors influencing interference have been thus enlarged upon before considering methods of commercial gear cutting in order that the advantages, shortcomings and reliability of various methods employed in the production of externally meshing cut gears may be more readily appreciated.

There are two methods by which surfaces may be reproduced, by the forming or the generating principle. The forming principle necessitates the use of a cutting tool with a cutting profile the conjugate of the surface to be reproduced and is simply and well illustrated in the operation of milling a cylinder with a concave cutter.

The forming principle, as it pertains to gear cutting consists of cutting the individual tooth spaces with a tool—usually a mill, to minimize the cutting time—conforming in cutting profile to the shape of the finished tooth space. The generating principle of gear cutting may be likened, so far as the result obtained is concerned,

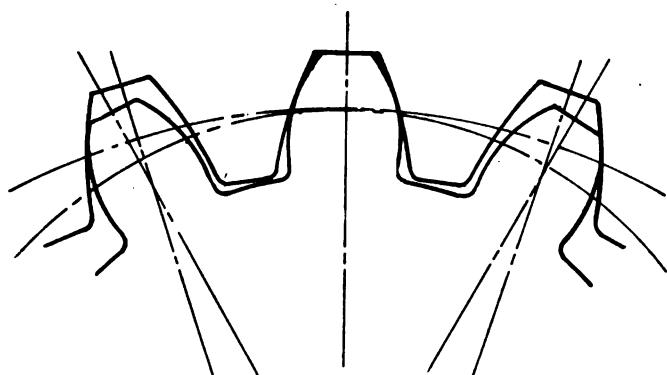


Fig. 1

to causing an accurately proportioned gear, or gear tooth, to roll in mesh with a plastic blank and so produce accurately proportioned teeth on the plastic blank which mesh with and engage precisely the teeth, or tooth, of the generating gear or tool. Applying the generating principle to cutting metal gear blanks necessitates the use of a tool, provided with hardened cutting edges, advancing in a line paralleling the tooth space axis and rapidly removing the metal as the gear blank is revolved upon its axis.

Forming Gear Teeth

In order to produce accurately proportioned gears by the forming method, a particular cutter would be required for each gear with a certain number of teeth, of a certain pitch and of a certain angularity of teeth. This would entail an unwieldy number of involute cutters for a manufacturer producing more than one of two individual sizes of gears, for which reason, in commercial gear production, sets of involute cutters have become accepted standards, each cutter supposedly being suitable for cutting gears with teeth of a certain pitch and angularity and in number covering a certain specified range. Until comparatively recently, a set of involute cutters for forming gears with teeth of given pitch and angularity, from 12 in number to a rack, consisted of eight cutters. More recently, the standard set has been increased to fifteen in number, by adding intermediate cutters. In the eight cutter set, for illustration, a No. 4 cutter was supposed to be suitable for machining gears of from 26 to 34 teeth. The introduction of the intermediate numbers refined the set by limiting the No. 4 cutter to use in machining gears with from 26 to 29 teeth and adding the No. $3\frac{1}{2}$ cutter for gears with from 30 to 34 teeth.

The fifteen cutter set is a great improvement over the original standard, it is true, but it is also evident that, if the No. 4 cutter is correct for 26 teeth it cannot also be correct for 29 teeth, or if the No. $3\frac{1}{2}$ cutter forms accurate teeth for a gear with 30 teeth, it fails to be cor-

rect for machining gears with 31, 32, 33 or 34 teeth, for the curvature of the involute profile changes with the number of teeth—see diagram, Fig. 1. Furthermore, the involute cutter is fitted to a template which is customarily filed out to approximate involute curves drawn on sheet metal, or in advanced practice, fitted to a template which is generated. In either case, no assurance is provided that the gears produced by the involute cutters will operate without interference, even if the cutting tool should exactly fit the template. It is just as impossible to produce sets of involute cutters of "standard" involute profile for gears with a difference in the number of teeth as it is to produce sets of a limited number of cutters suitable for a complete set of gears. Production by the forming method necessitates that the ends of the gear teeth—at least in gears with certain numbers of teeth—be rounded off to enable them to mesh. Though the involute profile toward the top of the teeth has to be modified in any event to enable certain standard involute gears to operate without interference, the modification necessary is not that of rounding off the tops of the teeth or arbitrarily destroying the involute curve in the vicinity of the addendum circle, as has to be done in gears machined with formed cutters.

The forming method in machining gear teeth fails in at least one of the main requirements—accuracy of tooth proportions—for productive gear cutting.

The section of a gear with an infinite number of teeth is a rack and in the involute system the profile of the rack tooth is a straight line inclined to the axis plane of the tooth and at right angles to the line of pressure or action. The curvature of the tooth profile disappears and the straight side of the tooth is of the type of surface most readily, cheaply and accurately reproduced by mechanical means, a simple, straight sided, "V" shaped cutting tool of truncated form, accurately conforming in section to the shape of the involute rack tooth space, being employed. Such a cutter, representing as it does a "master form," is the basic implement used in all systems of gear tooth generation.

The Principle of the Bilgram Machine

The principle upon which the Bilgram generating machine operates—depicted in the diagrams shown in Fig. 2—illustrates the simplest and most readily understood method of generating gear teeth. A simple straight-sided, truncated, cutting tool, conforming in cutting outline to the exact shape of the tooth space of an involute rack of the pitch and angularity of the teeth to be generated, reciprocates rapidly and at the same time travels in one plane from one side of the gear blank to the other, the gear blank meanwhile turning upon its axis at a peripheral speed for its pitch circle equaling the speed of traverse travel for the reciprocating cutting tool, just as a gear would revolve if actuated by an advancing rack. Ob-

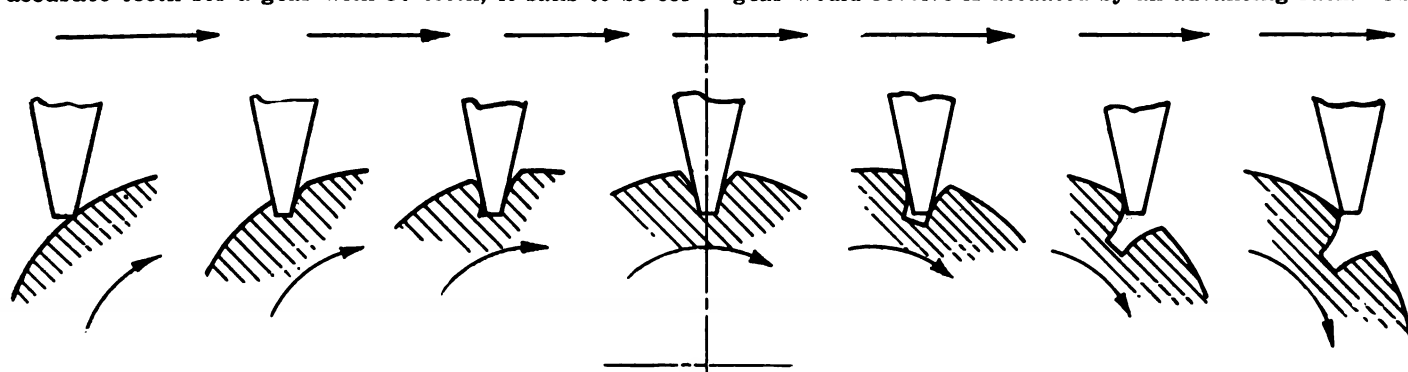


Fig. 2

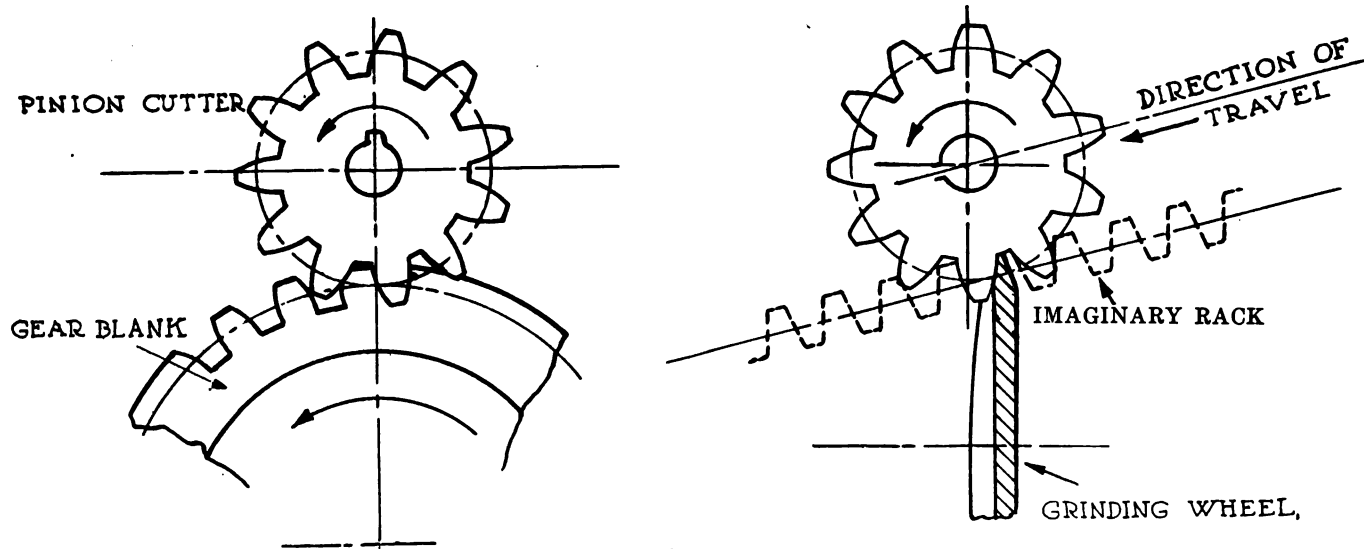


Fig. 3

viously, the simple reciprocating tool machines a tooth space bounded by profiles of pure involute curvature, completing the operation during the side travel of the cutter—see diagrammatic depiction. The same cycle of operations has to be repeated for each tooth space machined and, with only one cutting tool, the gear blank has to be indexed over the requisite distance between productive operations. In this manner, the action of a gear meshing and operating with a true involute rack is duplicated but, as the rack has but one operating tooth and there are no adjacent teeth to obstruct the advancement of the gear, the limitations placed on the involute system by tooth interference are disregarded. Thus gears generated by this basic method with teeth of pure involute profile may be quite incapable of being run together, on account of the involute interference which may be developed. Modification of the pure involute curve is necessary for gears with more than a certain number of teeth.

Factors Determining Interference

Involute interference can only be avoided, as has been demonstrated, by proportioning a gear combination so that the point of tangency of the line of pressure with the base circle of the pinion lies on or without the addendum circle of the meshing gear. This is fundamental. As a rack may be considered a gear with an infinite number of teeth, it is obvious that there will be no interference between the gear teeth of pure involute profile and a standard involute rack until the number of teeth to the gear, acting as the pinion meshing with the rack, exceeds some definite maximum number. In the $14\frac{1}{2}$ deg. system, interference between the teeth of a rack and pinion begins when the pinion has 31 teeth and, of course, the amount of interference increases as the teeth of the pinion are more numerous. In the 20 deg. system, interference commences in rack combination when the pinion has 17 teeth.

A gear with a small number of teeth—customarily 12 in number, for the teeth of a gear with fewer teeth would be seriously weakened by undercutting—may then be generated with a single rack tooth and its teeth of pure involute profile not interfere with the teeth of a standard rack or the teeth of any other gear of equal pitch and obliquity which will likewise operate with a standard involute rack without interference. Furthermore, the gears which will operate with the standard rack without interference, will also operate together. It is this fact which is the basis of the principle upon which the Fellows gear shaper operates. The reciprocating cutter of this type

of gear generating machine is a tool of gear form, with accurately proportioned teeth of involute profile, hardened, relieved and provided with keen cutting, or shaping, edges. In operation, the pinion-cutter reciprocates axially across the face of the gear blank being generated, revolving upon its axis as would a pinion actuating a meshing gear, while the gear blank also revolves upon its axis at a proportional speed, thus duplicating the operating action of a pinion and gear of similar speed ratio. Suitable indexing mechanisms control the movement of the cutter and of the gear blank and the result secured is identical to that which would come about were a pinion of some hard material and of accurate tooth proportions made to roll in mesh with a plastic gear blank—teeth of accurate form to mesh precisely and without interference are generated on the gear blank.

The curvatures of the generated teeth are of pure involute profile up to the interference circle, should one exist, and correctly modified between the interference and addendum circles to avoid interference of teeth, for, since the teeth are generated by cutters of pure involute curvature, the modification cannot be other than accurate and precise. The modification in profile curvature over the section developing involute interference consists in a progressive increase in the obliquity of the involute curve, for each individual point on the modified profile is also a point on an involute of a specific curvature, as it is a point of normal contact with a straight line tangent to a circle concentric with the base circle of the gear. In other words, the modification consists of a gradual increase in the angularity of the line of pressure, or pressure angle, and this, quite obviously, is very different from an arbitrary modification of the profile by rounding off the ends of the teeth. The Fellows system generates accurately proportioned gear teeth of "standard" involute profile. Uniformity of output is also assured by the ingenious and correct method of tooth generation.

Generating the Pinion-Cutter

The teeth of the pinion-cutter are themselves generated, but the operation is complicated by the fact that the cutting teeth have to be hardened and then precisely finished to make them efficient and effective tools. This necessitates that the cutter teeth be first roughed out, leaving a certain excess of metal to be removed subsequently. The cutter is then hardened and finally the profiles of the cutting edges are finished to correct involute curvature by a flat face grinding wheel. The flat surface of the grinding

wheel replaces the straight cutting edge of the reciprocating rack-tooth cutter of the Bilgram machines and the hardened roughed-out cutter rolls over the grinding wheel, traveling in a plane paralleling the line of pressure, instead of the rack-tooth cutter—represented by the flat face grinding wheel—traveling from side to side of the cutter blank, as in generating a gear by the fundamental shaper method.

The principle involved is the same as in the reciprocating rack-tooth cutter method of generation, the basic principle of gear tooth generation—see Fig. 3.

Comparing the respective speeds of generation by the single, reciprocating, rack-tooth cutter method and the pinion-cutter method, it is quite apparent that the latter method is much the more rapid, for several cutting teeth—usually three—are in operation at the same time, against one cutter in the less involved method and there is no necessity of back-indexing. The several engaging cutter teeth are not removing metal uniformly, it is true, and the single rack-tooth cutter does not remove the same weight of chip on each operating stroke, but the total amount of metal removed by the pinion-cutter per stroke—several cutting teeth functioning—is considerably greater than that removed by the single cutter, even when the latter is most effectively working. In fact, the machining rate of the reciprocating pinion-cutter exceeds that of a rotary formed cutter machining one tooth space at a time, despite the fact that the former method employs an intermittent cutting action, while in the latter the machining is virtually continuous when the cutter functions.

In connection with this question of relative productivity, however, it is a point of interest that in the manufacture of the pinion-cutters the generating method is not employed to rough out the pinion-cutter blanks preparatory to the hardening process. The roughing is done with rotary formed cutters that leave the excess metal to be removed subsequently by the generating grinder, after the roughed-out blank has been hardened. The reason for this apparent condemnation of the generating method by strong advocates of the principle is that the rotary formed cutter removes the metal more rapidly than can the single, reciprocating, generating cutter and for the roughing-out operation the accuracy of the formed cutter method is sufficient. Rather, its inaccuracy is no drawback, for the process of hardening the cutter-pinion is liable to deform to some extent the profiles of the cutter teeth, making necessary their correction by the precise means of grinding generation.

The Hobbing Method

If it were practical and feasible to replace the single rack-tooth cutter of the Bilgram generating machine with a series of accurately proportioned cutters in the form of a reciprocating rack section of sufficient length and to actuate such compound cutter in a manner similar to that employed for the single cutter—reciprocating across the face of the gear blank and at the same time advancing as if actuated by the rotating gear—teeth of "standard" involute form would be generated on the gear blank in a manner similar to that performed by the reciprocating pinion-cutter of the Fellows shaper method. The resulting gear teeth would be identical, correctly modified to avoid interference and precisely generated at a high rate of production.

Such a generating machine would not be practical, however, but a hob, which can be likened to a "spiral rack," can be substituted for the series of rack-tooth, reciprocating cutters and exactly the same result secured. This is the principle of the hobbing method of gear tooth gen-

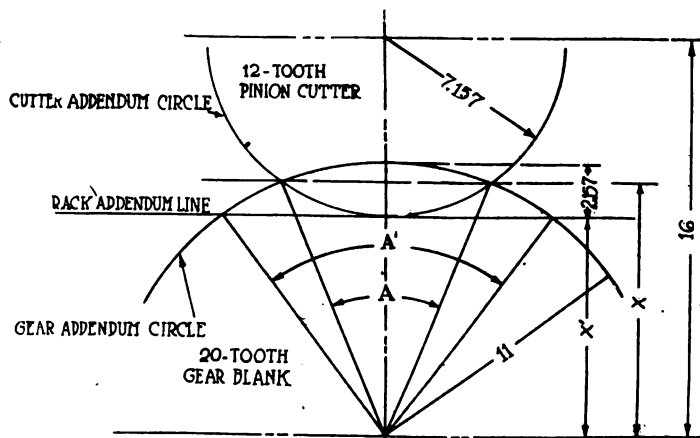


Fig. 4

eration, based on the same fundamental laws as govern the accuracy of the pinion-cutter method and of the simple, reciprocating, rack-tooth cutter of the Bilgram spur gear generator in cutting gears with such a number of teeth as are not subject to involute interference. The rotating hob is fed across the face of the blank, or the work fed past the revolving hob, the angularity of the cutting planes of the hob—the tread of the hob—paralleling the axes of the advancing teeth generated on the gear blank. If the hob is fed across the face of a blank mounted so as to rotate on its axis in a fixed position, the operation is the equivalent of actuating a gear mounted on a fixed axis by an advancing rack, the basic principle of gear tooth generation as represented by the Bilgram gear-generating machine. If the work travels while rotating and the hob remains in one position, the operation is similar to rolling a gear over a stationary rack, the principle employed in generating the pinion-cutter for the Fellows gear shaper, and the result secured is identical, for it is immaterial whether the rack or the pinion is the actuating member of the combination.

The hob presents several sets of cutting edges, functioning with greater or less effectiveness at the same time, and so possesses the superiority in rate of machining of the pinion-cutter but in even more marked degree. Disregarding the relative speeds of milling and shaping operations, the productivity of the multiple cutting edge tools is dependent upon the cutting arc of contact between the work and the cutting tool. In the case of the pinion-cutter machine, the curvature of the paths of the work and the tool when machining an externally meshing gear are opposed, so the arc of cutting contact is dependent upon the ratio between the diameters of the cutter and the gear blank. In the other case, the pitch line of the hob being straight, the arc of contact is affected by the diameter of the gear blank only and is consequently considerably greater, the diameter of the gear blank being the same in either instance.

The hob possesses also the continuous cutting capacity of the mill, so it is obvious that, with a materially larger arc of cutting contact and the avoidance of the idle strokes of the reciprocating tool, the rate of production by the hobbing process must be much higher than by the reciprocating pinion-cutter, shaping method. A specific case will perhaps better illustrate this point.

The diagram shown in Fig. 4 depicts the difference in the cutting arc of contact when cutting a 20-tooth gear with a 12-tooth pinion cutter and by the hobbing process. The superiority of the latter method in respect to arc of cutting contact is some 65 per cent. Now suppose the face of the gear being generated, or the aggregate width of a number of narrow gears being machined at the same

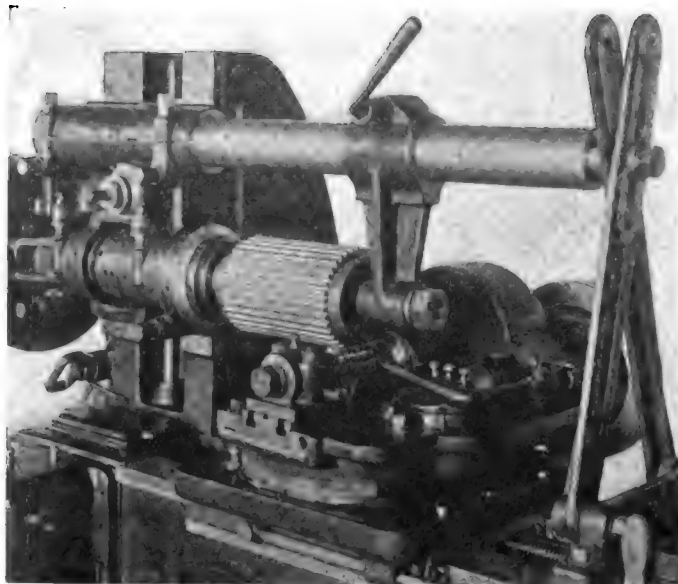


Fig. 5—Hobbing seven spur gears (horizontal class gear hobbing machine)

time, is equal to 6 in. The rotating speed of the hob is customarily between 50 and 250 r.p.m., so an average speed of 150 r.p.m. may be assumed to be typical and suitable for cutting the gear in question. The number of strokes per minute of a pinion-cutter shaper on such a job is also in the neighborhood of 150, so when generating the gear of 6-in. face the cutting speed (effective) of the reciprocating tool is about 75 ft. p.m. The standard diameter of hob for one well-known line of gear-hobbing machine is $4\frac{1}{2}$ in., which, if used in the present case, would give a hob-cutting speed—hobbing being virtually a continuous operation—of close to 175 ft. p.m. With a cutting arc of contact nearly 65 per cent. greater and a cutting speed approximately $2\frac{1}{3}$ times that of the pinion-cutter, it is quite evident that the production by the

hobbing method would be much the more rapid. The ratio of productivity might not be as great as 3.85 to 1, but there can be no question as to superiority of the hobbing machine from a purely productive standpoint.

Development of Gear Hobbing

In fact, it has been the unprecedented demand for the accurately cut gears required for automobile and tractor transmissions, typewriters, adding machines, change gears for machine-tool drives, phonographs, speedometers and the many mechanisms of precision now manufactured on a large commercial scale and calling for intensive "quantity production" that has brought about the development of the gear hobbing machine. The requirements for securing high rates of production in accurate cut gearing were well brought out in a paper read before the American Gear Manufacturers' Association in April, 1918. Therein they were listed as:

1. Continuous cutting action,
2. Generation of each tooth by a single tooth or tooth profile,
3. Distribution of cutting action around the blank to avoid localized heating,
4. Continuous indexing by rolling, so as to assure accuracy in spacing—impossible by intermittent methods.

It would appear that the hobbing method of gear-tooth generation exactly meets these specifications, for hobbing is to all intents and purposes a continuous milling process and each tooth space is generated by one set of the hob-cutting teeth. The rapid rotation of the hob and the gear blank assures a distribution of the heat developed in machining and insures against localized heating or excessive expansion. Indexing is a continuous operation, for each revolution of the hob spaces out a tooth on the rotating gear blank and there is no call for the indexing

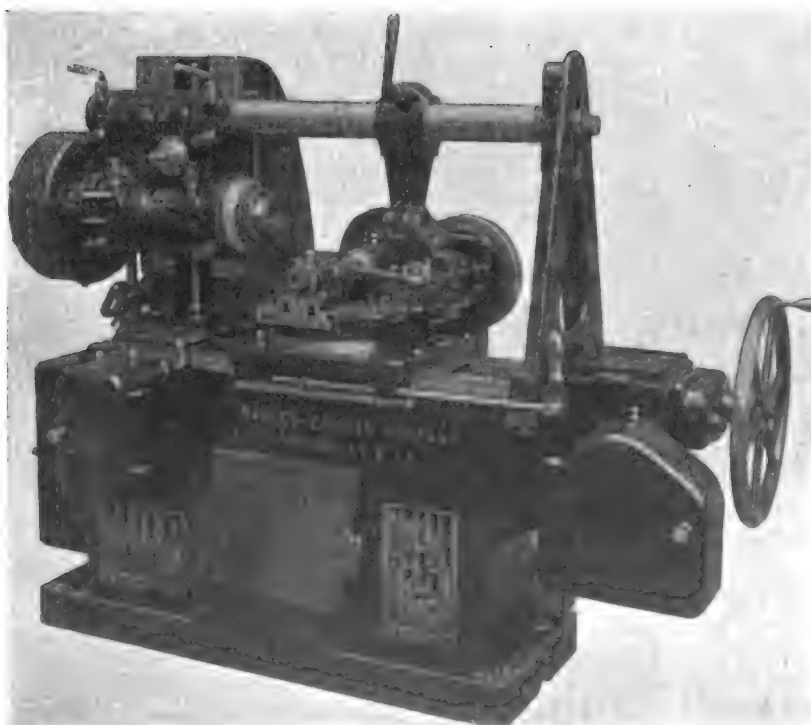


Fig. 6—Barber-Colman (horizontal class) gear hobbing machine (hob travels)

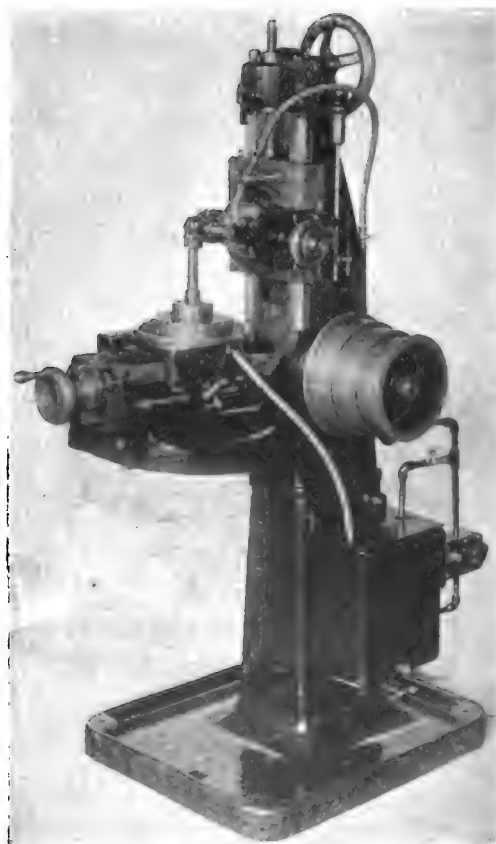


Fig. 8—Hercules (vertical class) gear hobber

mechanism to withstand such shocks and jars as are developed in the intermittent method of shaping, or planing.

The indexing of the gear blank in the approved type of hobbing machine is through, or harmonious with, the driving mechanism of the hob, so that the ratio between the hob speed and work indexing is synchronized. Should the hob slow up on encountering a hard spot, the indexing of the work is correspondingly retarded, maintaining the proper relation between hob speed and the advancement of the work under all conditions.

The value of the hobbing method was first recognized for roughing out gear teeth, but it was discovered that teeth could be finished by the same method with a high degree of accuracy, using the ordinary polished hob correctly centered. That is, for the ordinary run of work, satisfactory accuracy of tooth was obtainable with standard gear hobs and the refinement of the use of "ground hobs" only required for extremely precise gearing, if necessary even for such delicate work.

Accurate hob manufacture is no sinecure, but the double operation entailed in forming and generating pinion-cutters is avoided by the shape of the hob tooth. In the case of the pinion-cutter, the teeth are bounded by involute curve profiles which are apt to warp and distort on cooling, if hardened after being generated to true profile curvature, necessitating leaving the excess of metal to be removed by grinding generation after the heat treatment of the cutter. The section of the hob tooth—the straight-sided rack form—is such that there is a maximum of metal within the bounding periphery, so distributed that the tooth can be brought to a high temperature and then cooled without developing distortion or unbalanced thermal strains. The result is that the profiles of a gear hob when polished after cooling are as precise as before heat treatment. The hub of the hob is more liable to distortion from the hardening process than are the teeth, so the hubs of high grade gear hobs are trued up by grinding.

Hobbing Machine Classification

The principle of gear hobbing being basic, the logical classification of gear-hobbing machines is by design, rather than by any marked difference in operation. The natural differentiation is then whether the machines are of the horizontal type, carrying the work axis in a horizontal plane, or of the vertical type, resembling more the boring mill construction. Obviously both arrangements can be, and are, employed, for a gear will function in any plane. There is also one other marked difference in the construction employed by different manufacturers, whether the work travels or the hob. Theoretically, it makes no difference which of these members travels, and both schemes are utilized in gear hobbers of the horizontal class. In the vertical class, it is the hob that travels, except when generating worm wheels, in which operation there is no travel of either the hob or the gear blank, once the cutter has been fed to depth. This is equally true for both classes of gear hobbers.

Whether it is more advisable for the hob or the gear blank to travel cannot well be discussed in a paper of this character, but a few remarks should be made concerning points in design that affect the quality of the machine output. Such special features of merit as may be possessed by the hobbing process of gear generation in commercial manufacture are governed by the requirements for productive gear cutting of precision, so points of design must be appreciated and may be properly referred to.

Two essential points in the design of gear hobbing generators must be kept in mind, if the relative merits

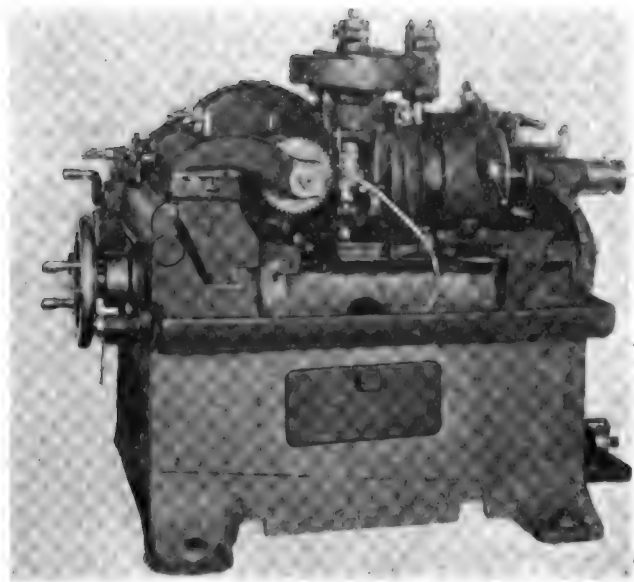


Fig. 7—Lees-Bradner (horizontal class) gear generator (work travels)

of various constructions are to be judged without bias. In the first place, rigidity of machine is important, for the generation of the involute profile and its necessary modifications to avoid interference and to secure the uniformity of output required, for interchangeability of gears is an operation of precision. It takes only a small amount of play to depart considerably from the true profile of a curve of progressive curvature. The second essential is that the cutting speed and the travel of the work or hob be synchronized, for otherwise faulty—meaning really unsatisfactory—output is bound to result.

Supporting the work on a horizontal spindle—the horizontal class of machine—requires, in the first place, that the blank have a bore of relatively large size for the pitch of the gear to be generated, as the torsional stress developed in the work spindle—unless some driving connection can be made nearer the periphery of the gear, a type of driving dog—is unusually heavy. It is good practice, for machines in which the travel is done by the hob, to provide a substantial bar paralleling the axis of the work from which a stiff steady-rest may be adjusted to support the outer end of the work spindle. In clamping the steady-rest to the guide bar, care must be exercised, however, to maintain accurate alignment of the work spindle.

Likewise, in the type of horizontal machine in which the work travels and the hob rotates in a fixed position, the work carriage should be substantial and accurately fitted to its ways, for the tendency of the hob is to force the work out of mesh.

The thrust developed in the horizontal class of gear hobbing machines parallels the axial direction of the gear teeth in the plane of generation and is usually, therefore, more or less horizontal. Being unbalanced, it has to be absorbed by the frame of the machine, necessitating a heavy and well-proportioned construction for a relatively small machine tool.

The synchronizing of the cutting speed and travel, in either the horizontal or the vertical class of machine, necessitates that the work and hob spindles be geared in series—not in parallel—for the blank and the cutter must run as a unit, if accuracy and uniformity of output is to be realized. The drive of the index must respond to all influences affecting the cutter drive. If the hob should encounter a hard spot or its speed be retarded or increased by any cause, no matter how slightly, a corre-

sponding adjustment of the indexing is essential—secured instantly and automatically.

The approved design for the vertical machine is a rigid box column construction with a substantial base. The work is carried on a face plate of the boring mill type supported by a powerful bracket on the main vertical column and the hob travels in a vertical plane on ways forming part of the main column, the feed of the hob controlled by a heavy central screw. This construction simplifies the design, the vertical machine occupies less floor space than the horizontal and rigidity is secured with considerably less weight.

The work rests naturally on the horizontal face plate, to which it may be clamped firmly or held on a vertical arbor that can be stiffened by a simple arbor support. The hob carriage travels on vertical guides and is further supported, guided and stiffened by the actuating central screw, acting as a jack. The weight of the moving mass is productively utilized during the functioning travel of

the hob. The thrust developed in hobbing, being in a more or less vertical plane, is absorbed by the base of the machine and its foundation, first being partially counterbalanced by the weight of the moving parts.

Another feature of the vertical construction worthy of attention is that, as the direction of cutting is from the upper to the lower side of the work and the hob revolves in an anti-rolling direction so far as its passage across the work is concerned, the chips are thrown from the cut and drop free from the hob.

There are, of course, numerous details of construction in both horizontal and vertical machines, refinements, special attachments, etc., that have not been touched upon, but the main requirements and outstanding features of the two classes of machines have been pointed out in order to complete an exposition of the hobbing method of gear generation by laying some emphasis upon the mechanical considerations affecting the attainment of the goal of productive gear-cutting by such means.

Electric Melting Apparatus

THERE has recently been developed an electrically heated pot for melting battery compound and other compositions of like nature. The heat is provided by a 3-heat unit of the well-known cartridge type, which is inserted in a slot at the bottom of the pot. This unit is regulated by a three-point plug switch for obtaining three heats, and does not require any attention from the operator.

Thus, a uniform, well distributed heat is assured, and the danger of fire from overheating, and of cooling from insufficient heat, during the operator's absence is eliminated. If the operator is called away, he may leave the pot without any fear of its contents catching fire, and while the heat is sufficient to keep the compound in a molten state it is not enough to cause combustion.

The pot is said to be as nearly foolproof as such a device can be, which should be a subject of consideration for those familiar with fires caused by the careless upsetting of compound into a flame, or of going away and allowing the compound to catch fire through forgetful-



General Electric Bench Type Metal Melter

ness. The device is made by the General Electric Co.

Another electrically operated melting pot made by the General Electric is intended for melting lead, babbitt and similar metals, and is known as a 25-lb. electric melter bench type pot. The device is designed to eliminate the loss of time and material and to reduce the fire risks which frequently accompany metal melting.

The pot has four short legs, so that it may be stood on a table or floor, without fear of upsetting, or lowered into a recess so as to be flush with the top of the table. The heating element is a coil, insulated from the outside, and wound around the container from top to bottom to insure an even distribution of heat through the contents of the pot and to prevent loss from radiation.

A feature of the device is the automatic regulation, which depends upon the fact that, as the temperature of the coil rises, the resistance rises proportionately, thus diminishing the current and reducing the supply of heat. The initial rise of temperature is sufficient to melt cold metal quickly, whereupon the current drops automatically and prevents the burning of the metal, at the same time retaining it in the molten state.

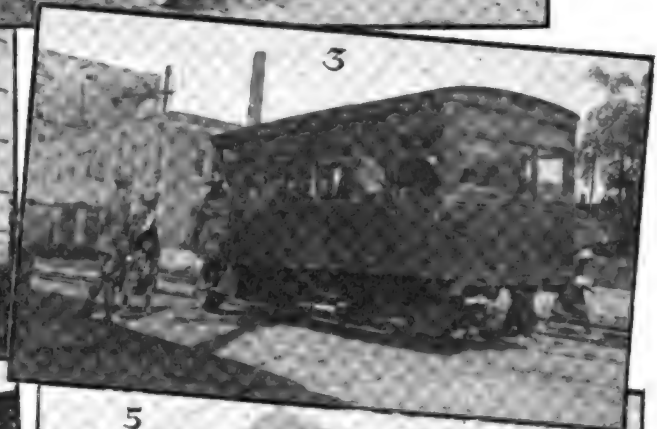
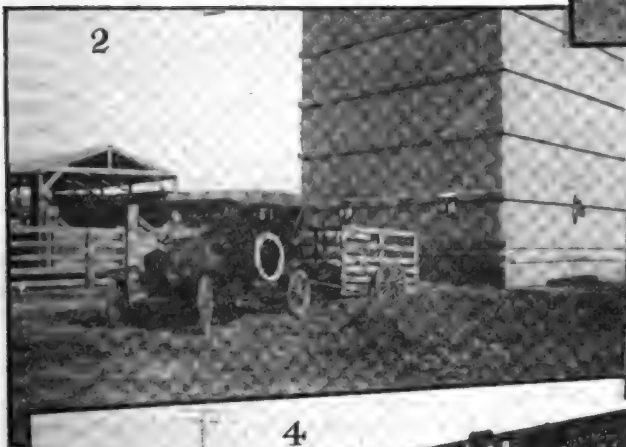
The automatic heat regulation enables the operator to leave the pot, when necessary, without fear of fire. Also, the thick scum of oxidized metal which would result from overheating is practically eliminated.



Electrically heated pot for melting battery compound

Farmers' Machines Meet Agricultural Demands

The photographs on this page were taken in Kansas and show how the farmers themselves have rebuilt their cars and trucks to meet their individual needs — an evidence of the growing motorization of the farming districts



1. Note the home-made drop board. 2. An improvised stock trailer. 3. A Reo truck carries passengers on a Kansas railroad. 4. A portable chute for unloading stock from trucks and trailers. 5. Improved stock body. 6. Carrying chickens. 7. Similar to 5, home-made bodies for carrying stock

Winning the Worker to the Time Study Plan

The general hatred of the machine operator for the time investigator is almost an industrial tradition. But careful methods, prompted by the proper spirit, will eliminate at least a large part of such feeling. This article relates how one company evolved a study department that has obtained a large measure of good-will from the workers.

PIECE-RATES maintained despite large individual earnings, a highly capable department personnel and careful and accurate studies, comprise the chief factors of success for a thoroughly effective time study department. Though some of these factors are difficult to obtain in the fullest degree, their value and practicability are attested by the results obtained in one large automobile plant.

The time study department developed at the Hudson Motor Car Co. comprises a number of distinctive features which make it an excellent example of the possibilities of this part of a factory organization. While the work accomplished by this department is particularly effective, it is exceptional in the spirit behind its work and the thoroughness of its operation rather than in distinctive innovations or new methods.

The first thing of interest is the fundamental conception upon which the scope of the work is founded. The basic purpose is to make time studies and adjust rates that will be fair to the workman and the company alike, and to do this in a way to obtain the fullest co-operation of both management and operators as a means toward obtaining the greatest ultimate production. To fulfill this mission in a highly effective way is a difficult task, as will be witnessed by every person who has been involved in making piece-work rates and maintaining them so that they are satisfactory to the company and to the workmen. A number of definite methods and practices have been adopted by the Hudson time study department in its successful effort to meet the conditions.

Probably the most important policy is that of never cutting a piece-rate when once it has been set, unless some change is made in the operation. This rule applies both to individual rates and to the rates assigned to gangs whose final product is paid for at piece-work rates. This fundamental rule having been laid down, exceptionally careful work is necessary in the study department if the rule is to be carried out without injustice to the company. Piece-rates hastily or carelessly set might easily be so incorrect that the company would lose money on increased production. With such a policy to be carried out, it is necessary that the studies be made accurately in the first place so that, regardless of how much the man is able to produce, his increased production means increased profits to the company.

With this thought in mind, the personnel of the department was given particular study. The time study men in this plant must be able to do much more than time an operation and list the results on a sheet of paper. They must, first of all, be expert mechanics; they must be capable of setting up and running any of the

operations themselves; they must know at least as much about the job as the foreman.

They must be able not only to understand thoroughly the particular job they are studying, but also to see that job in its relation to the entire production scheme. Finally, they must be tactful and diplomatic; they must be able to talk to an operator in such a way as to get his co-operation in making the study. Since they are expert mechanics, they can command the respect of the intelligent workman because they talk to him in his own terms and in his own language. They must also be able to talk to him as man to man, that no antagonism or ill-feeling may arise. Difficulty was experienced, of course, in filling the department with men of this kind, but constant effort and conscientious training have finally developed such a group of trained workers.

From a mechanical standpoint the time study made at this plant is particularly excellent. The study man knows the tool feed, the cutting speed, and the cut in inches at which the particular machine is capable of doing its best work. He regulates the machine with this in mind and thus is certain in making his study that the time taken will not be made inaccurate by a faulty regulation of the machine. He then analyzes the operation and lists the various details on a form similar to that shown in Form 1. The operation is then timed, just as in any other plant, and the results recorded on the form.

As in many automotive plants, a basic day rate is allowed the man. He receives this if he is not able to make more by the piece-work rates. The rate is set here, however, with the average man as a basis. This is not so difficult to do when the time study man thoroughly understands the operation he is timing for, by regulating the machine so that he knows it is giving maximum production, the movements of the workman himself are the only variables in the actual operating time. When the operation has been timed, certain allowances for tool trouble, etc., are made and the piece rate is then established as a result of this careful study.

The record of every study is kept on file as a permanent record. That study, having been carefully and properly made in the beginning, will be as correct ten years from now as it is to-day, provided there has been no mechanical change in the operation. Thus, if an adjustment of rates is necessary later, it can be made in the office on the basis of the original study.

When the piece-rate is computed, it is, of course, set at a figure that leaves a margin of profit for the company on each piece produced. Thus, regardless of how much money the man makes, the company is glad to have him

Forms important factors in the development of an effective time study department
Form 1 is used to record actual time studies, Form 2 to carry requests for investigation to the time study department, and
Form 3 to bear recommendations for change from the time study department

The machine, in short, is the major factor and, when properly adjusted, will yield about the same production for any ordinary workman regardless of his individual efforts. Exceptional men are very occasionally found who can "beat" the estimated average earnings by a considerable amount. Such men act rather as an added incentive to others than as a means of breeding discontent, because they are allowed to earn all they can without a cut in rates. Thus, the average workman is given confidence to do likewise, with the assurance that his rate will be maintained. Such cases must necessarily be rare, however, when the time study is properly made and the rates equitably adjusted.

The chief reason for this all too common practice of

"pulling a watch" on a man when he does not know it is dictated by the fear that the man will consciously slow up while the study is being made that he may be able to earn a great deal each day with a minimum of work. This possibility is eliminated largely in the Hudson system, however, by the proper regulation of the machine. This is the chief feature in production, and experience has shown in this plant that the man's movements can be left to themselves, since they play a minor part in the total time of most machine operations.

The time study man who stands behind a post and attempts to time an operation has been so universal in the past that workmen have come to characterize any time study man by common but not complimentary titles. With this tradition to overcome, the department in this plant set out some four years ago with the determination of setting fair rates by honest methods and of getting the workers with, instead of against, the time study men.

This has been accomplished to a large extent by using as time students only mature men and expert mechanics who can command the respect of the skilled operator. One skilled workman is likely to enjoy dealing with another who is his equal in knowledge; as a result this department experiences little trouble in getting the co-operation and good-will of the better workmen. Difficulty is experienced, however, in the case of men who are supposed to be skilled but are not. A "bluffer" finds his bluff "called." In such cases the time study man demonstrates to him the correctness of the study and he is forced to admit his error. Such expert time setters are helpful, as well, to men who perhaps do not understand the work as well as they might but who hesitate to admit their deficiencies to the foreman.

To develop the time study work along these high grade and efficient lines, it has not been necessary to use a large force of men; in fact, the Hudson department is probably one of the smallest in the country, in proportion to the number of men employed in the plant and the machines and operations to be studied. There are nearly 8000 men employed, while the study department has but twelve men actually engaged in making investigations, three of these acting in a supervisory capacity. This small force is made possible by the high type of men utilized in the work. One man of this kind who knows his job thoroughly from every standpoint is able to accomplish three times as much work as a man less fully trained and less capable of doing the work.

The benefits derived by the production and employment departments from an open and above-board time study system have been demonstrated to be great by the experience of this plant. To begin with, the time study department is thoroughly supported by the management in its effort to give the men a square deal. This support is indispensable. When the time study man goes into the shop he approaches the workmen openly and makes his study without "camouflage." He does not argue with a workman or have trouble with him; any difficulties are adjusted off the shop floor. Every effort, however, is made to have the worker feel that the time study man is there to fix a rate that will be fair to every one concerned.

The general attitude of the workman toward the time study man is one of intense antagonism, suspicion and distrust; this is generally recognized. In developing the department it was felt that such an attitude, although perhaps unjust, was to some extent the fault of the investigators. How well the "good-will" method has succeeded is evidenced by the fact that in only one case during the past few years has a workman definitely condemned the time investigator and this man was finally

convinced, by practical demonstration on his own machine, that he was wrong.

On the other hand, the machine operators have come to know that there is a square deal waiting for them at the time study office. As a result, they have gotten into the habit of going to that office with any kicks or claims they may have as regards the justice of rates. When a man does this, his case is investigated thoroughly and whatever the decision may be, it is made known to him, together with the practical reasons.

As a further means of obtaining maximum production, provision is made for temporary rate adjustments. Such adjustments are recorded on a pink slip, similar to Form 1 except as to color. This slip is used in case much exceptionally poor stock happens to be coming through, in case of improper fixtures or similar difficulties. This temporary rate is put through for a specific length of time and the workman is made aware of this fact together with the temporary rate. Should the unfavorable condition continue, the rate may be extended for another definite period. In every case, however, the policy is carried out of putting all the cards on the table before the operators.

Although this time study department is somewhat exceptional in having been able to "get the workmen behind it," the necessity for gaining the hearty co-operation of both foremen and executives has not been overlooked. Form 2 is provided for requests for an investigation and adjustment. This form must be signed by both the foreman and the division superintendent.

Form 3 is filled in by the time study department when it has made an unsolicited investigation and desires to have a certain change. In this way, complete co-ordination of the whole organization is obtained.

No changes are installed or operation inaugurated without the complete information and consent of every one involved. As a consequence, by sincerely cultivating and keeping the good-will of both the workmen, the foremen and executives, the department operates, not—as is often the case—as a means of causing dissatisfaction and trouble but as a positive co-ordinating agency and as a means of securing better and more efficient production.

It is difficult to estimate in figures the ultimate effectiveness of a time study department operated along these broad lines. The effect upon contentment among the men and labor turnover is, however, a definite one. This is illustrated by the fact that in the crankshaft, crankcase and countershaft departments—employing about 120 men—only about three men a week are hired. Before the installation of the present time study department the turnover in these departments was much greater.

A recent survey of a number of prominent automotive plants revealed the fact that one of the greatest causes of labor turnover and dissatisfaction among the workers is the practice of cutting piece-rates when a man has reached a certain earning power. This practice, of course, retards production considerably and, in addition probably causes more ill-will than any other single factor of industrial relationships.

The apparent necessity for rate-cutting arises chiefly from wrong time study methods. A good study in the first place eliminates the necessity for constant re-adjustment and enables the management to deal with its workmen on an open and fair basis. Investigators who make studies at a distance of 20 ft. from a machine and indulge in other inefficient and unethical practices probably lose an infinite amount of money for their firms both in setting rates carelessly and in causing expensive labor turnover.

A Study of the Methods and Operations of Japanning Practice

Part I

Much that is old and unsystematic has clung to the japanning processes utilized in many of the automotive plants in this country. Mr. Darrah sets forth his studies along this line, a comprehensive article being the result. The second part, to be published next week, will describe plants and ovens.

By W. A. Darrah*

WHILE the japanning operation is one of the most important from the standpoint of finish and appearance, it is one of the few manufacturing operations that the average automobile manufacturer carries out on a rule of thumb basis, trusting to traditions that the result will be satisfactory. Possibly the aggregation of chemical engineering, heat application and mechanical problems has combined to cause this condition. The following investigation has been made to systematize the industrial operation of japanning by analyzing the process and placing the various steps on an engineering basis.

The lack of definite knowledge regarding japanning practice frequently begins with the manufacture of japan itself. In spite of the fact that excellent finishes are now available, many manufacturers are following recipes which in some cases are over a generation old.

The average commercial japan usually comprises the following ingredients:

1. Linseed or other oxidizing oil.
2. Gums or pitches.
3. Drier.
4. Color.
5. Solvent.

Fundamentally the average japan consists of a drying oil that forms most of the body and serves as a medium to impart flexibility to the finished coating. Linseed oil is most commonly used for this purpose, although other drying oils may be employed with the proper precautions. Incidentally, the basic cost of the japan is controlled by the quantity of linseed oil employed. The quality (durability and protection) of the japan is dependent also upon the amount and grade of linseed oil employed.

The presence of an excess of linseed oil has a tendency to make the finish less brilliant than normal but gives a thicker coat and greater durability. The surface is also somewhat softer and loses its polish more readily. The protection to the metal is good, however. On the other hand, too little linseed oil is usually compensated for by the addition of more gums or pitches, in which case the tendency of the japan is to be rather hard and brittle, but the finish is brilliant. It is a tendency, therefore, of the cheaper finishes to be rather more brilliant than the higher grade products but the coating is thin, cracks off

with comparative ease and the protection to the metal beneath is imperfect.

In some cases rubber has been substituted for linseed oil in certain japans, particularly those employed for the first or priming coat. At the present market prices, little rubber is employed, although the trade name "Rubber Coat" has become established to a certain extent and is frequently used. It appears that rubber acts in substantially the same manner as linseed oil, except that it does not give the smooth finish common to oil. It will be apparent that the function of the oil or rubber is to act as a flexible binder and supply the protection to the metal surface, while the gums and pitches serve to give hardness and brilliancy to the finish.

Most baking enamels are either black or dark colored because of the great difficulty in quickly applying and baking a light colored enamel. Even under the most careful handling the lighter colored finishes have a decided tendency to turn yellowish or brownish. Fading is a common occurrence during the baking of most colored japans and the final result is generally unsatisfactory. Carbon black is employed in the primer coat of many of the black japans with excellent results. Aside from the relatively small use of black pitches or gums, carbon black is the most used coloring material, and is to be recommended.

Driers are frequently added to commercial japans but such practice is not entirely to be desired. The nature and amounts of the drier employed is of fundamental importance, as any substance that subsequently may be attacked by moisture and air must be entirely avoided. The organic driers are probably the least harmful. It should be noted that the conditions under which japans are usually baked are such as to reduce materially the necessity for a drier.

The solvent generally employed is either benzine or solvent naphtha. Benzine is to be preferred, although both materials merely act as a thinning medium and enable the mechanical application of the japan with greater uniformity and with minimum labor. The solvents are, of course, entirely removed during the drying and baking operation and it appears that they do not combine in any way with the materials of the japan. Colloidal protecting substances are frequently added, although it must be admitted that in most cases this is a result of experience rather than design. The substances serve to keep the solid materials in suspension, thus materially

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improving the practical working characteristics of the japan.

As a rule, commercial japons carry about 50 per cent by volume of solvent. It is not unusual to add 15 to 40 per cent additional solvent at the enamelling plant, in order to facilitate handling and application. The exact viscosity of a japan can be controlled absolutely by the amount of solvent (assuming that measurements are at a constant temperature) and this is a point of vital importance from the standpoint of securing a uniform product. It is impractical to advise the best viscosity to employ without a full knowledge of all the conditions under which the japan will be used as well as the grade of product which is desired.

The matter of purchasing japan at present is surrounded with much mystery. General appearance and characteristics will tell almost nothing about the quality of the japan. A trial application and test of the resulting enameled surface is a successful and reasonable basis for selecting japons but it should be kept in mind that the means of application and conditions of baking have an extremely important bearing on the appearance and durability of the product, so that an excellent japan may give inferior results when not handled in the best manner. Further, an "accelerated test" is likely to be deceptive; an actual life test is the only certain basis for comparison.

It has been the writer's experience that most japan manufacturers are conscientious in their endeavor to supply a good grade of product. Unfortunately, competitive conditions are such that the price the consumer wishes to pay is determined and a japan representing the best grade available for that price is submitted. The ingredient having the most basis in determining the selling price (and quality) of the japan, is linseed oil. In many cases the higher quality japons contain more expensive gums while the cheaper japons may even contain shellac and stearine pitch.

Function of Japan

In order to decide intelligently upon the best grade of japan and the best method of applying and handling the material, a brief consideration of the function of japan is desirable.

The original and primary objects of applying a finish to the metal parts were to protect these parts from excessive deterioration and to supply a pleasing appearance to the finished article. In order to realize these conditions in practice, the japan must be weather proof, somewhat flexible, sufficiently thick to be lasting, must have sufficient hardness to prevent excessive scratching under ordinary service conditions and should take on a brilliant finish. In the following discussion, an attempt will be made to indicate how these somewhat contradictory requirements can be commercially fulfilled in an ordinary industrial plant without the expenditure of excessive money.

A fundamental requirement of any plant using large quantities of japan is adequate provision for securing a uniform product. As a rule the japan manufacturer is able to supply a substantially uniform product initially, so that the user can confine his attention (aside from the ordinary inspection laboratory tests on purchasing) to equipment designed to maintain constant throughout his own operations.

Most systems, whether they be of the dipping, spraying or flowing type, will require a very considerable storage capacity for mixed japan (that is, japan plus solvent) and also adequate tankage for mixing the material in use with additional solvent to maintain the viscosity standard. It is desirable to maintain a uniform temperature throughout the rooms where the japan is handled or mixed. Uniformity is the essential feature, but best re-

sults appear to be secured when the temperatures range from 80 to 100 deg. F. Obviously, the higher the temperature of the japan, the smaller will be the amount of solvent required to secure a given viscosity. On the other hand, if the temperature of the room and the japan is too high, the solvent has more tendency to evaporate.

Another consideration of prime importance is to continually agitate the japan in all parts of the system. Even the highest grade product has a decided tendency to deposit some of the heavier ingredients on standing. One engineering means of reducing this trouble is to avoid the presence of pockets or undrained pools of japan in any of the piping or tankage system. Entering pipes should end near the top of the tank and exit pipes should be connected to the lowest portion of the tanks. All tanks should, of course, be covered wherever feasible and should expose a minimum surface to the atmosphere in case it is impractical to cover them. Lights and flames should obviously be kept very far away from all japan equipment.

The Circulating System

The most satisfactory method of agitating large quantities of japan usually involves a circulating system, including circulating pumps, lawns or strainers, mixing tanks equipped with agitating means and a piping system which well may be provided with heat insulation in case the pipes pass through rooms having a lower temperature than that at which the japan is maintained. The mixing and storage tanks well may be equipped with some means, such as hot water pipes, for maintaining the temperature constant, although if the temperature of the entire room is thermostatically controlled this precaution is not always essential. Japan handling systems can be placed underground to good advantage, as this serves to keep the temperatures uniform throughout the year.

Japan usually is applied in one of three ways: Small articles, such as fenders for automobiles and similar materials, may be dipped directly in the tank of flowing japan and after a period of dripping may be carried by conveyors into the baking oven. Large surfaces that cannot be conveniently dipped may be coated by flowing. In this case the japan is pumped through a hose and out of an elongated slotted nozzle, in such a manner that it flows smoothly and regularly over a considerable surface at any one time.

A third method (also used for applying paints) consists in spraying the coating material by a stream of compressed air. This, when properly handled, allows the production of good results, and also permits some control of the thickness of the coat. The application of japan by spraying is, however, attended by serious personal inconvenience, due to the unpleasant vapors invariably resulting, and for this reason labor is relatively expensive and difficult to handle. Some attempts have been made to produce an automatic spray or mist, so arranged that the article to be treated passes through a closed chamber on a conveyor and under these conditions is entirely coated with paint or japan. Control of the speed of travel of the part to be coated offers a rough means of controlling the thickness of the coat. The spraying method is probably more frequently employed in connection with the painting of chassis and similar parts which do not require a high grade of finish.

The amount of japan which adheres to a freshly coated surface is naturally a variable, depending upon other factors. It is, therefore, impossible to make a general statement for all cases, but some instances resulting from actual experience may be helpful. In one instance, covering the enameling of such materials as front guards, mud aprons, runabout shields, tanks, etc., actual practice

indicated a consumption of 1 lb. of japan to each 50 lb. of sheet metal enameled. The metal in this case was naturally a variable, ranging from No. 12 to No. 18 gage. In another instance in which japan is applied (by flowing) to one side of the surface only, an average of about 1 lb. of japan to 180 lb. of metal is employed. In this case the average thickness of the entire surface averaged around No. 14 gage metal. In general it would seem that about 25 sq. ft. of surface may be covered by 1 lb. of japan in one coat, although as pointed out above, this quantity is so closely tied up to innumerable variables that only an approximate estimate can be made. In case a primer coat is applied to the metal, average practice indicates that about 30 per cent additional weight of japan will be required. In other words, because of the numerous crevices which must be filled, the first, or priming coat, requires on the average about 1.3 lb. of japan for each 25 sq. ft.

It should be understood that the figure of 1 lb. of japan for each 25 sq. ft. of surface applies to the dried japan, as is also the case of the value given for the first or priming coat. The weight of wet or liquid japan, which adheres to 25 sq. ft. of surface, will approach 3 lb. After dripping, the loss in weight by this operation will average about 1.75 lb., while the remainder of the loss in weight results from the evaporation of the solvents during the drying operation. In case the primer coat is sanded before the application of the finish coats, the weight of dry japan removed will range around 0.5 lb. per 25 sq. ft. of surface.

As a rule, spraying japan weighs about 7 lb. per gal., while the spraying paint used on chassis and similar parts will weigh about 9 lb. per gal. From this data and the information given above, it is possible to calculate accurately the quantities of japan required for a given production and this data, taken in connection with the figures given in connection with the circulation required, will allow fairly accurate design of the japan handling equipment. The speeds allowable for the travel of japan through pipes and conduits should somewhat exceed the safe speeds for the flow of oil.

The explosive nature of a mixture of air and the solvent used in japan necessitates a careful study of the circulation system (for air) wherever japan is employed. As a rule the danger limits lie between 2.4 and 6.1 per cent of solvent in pounds. In other words, a mixture of 100 lb. of air and 3 lb. of evaporated solvent is extremely dangerous and many disastrous explosions have resulted in the early days of japanning, due to the ignorance of this condition.

It is good practice to maintain the maximum concentration of benzene solvent in air less than 1 per cent by weight, as under these conditions explosions are practically impossible. The above basis of calculating the necessary amount of air circulation is, in the writer's opinion, much more logical than the empirical method frequently employed, of assuming either a given number of changes of air per hour, or a given number of cu. ft. of air per pound of material japanned. The misleading results which the latter method may involve will be apparent when a comparison is made on this basis of the air circulation required for japanning engine flywheels and for japanning automobile fenders.

Cleaning the Metal

It is good practice to clean thoroughly the metal surface before applying the japan coating. While this subject should logically precede the discussion of the application of japan, because of its connection with ovens and heat treatment, it seems logical to include it at this point.

It is, of course, evident that when the metal surfaces

leave the presses and the assembly room, they will be covered with a considerable amount of grease and other organic impurities resulting from the shaping and handling. If this material is not removed the japan will not adhere uniformly and the appearance will be very unsatisfactory.

Several methods are used in practice to remove the oil and grease. One method consists in washing the surface with gasoline or other solvent. This method is usually quite effective but, as a rule, requires more labor and greater care. It is not automatic and depends to some extent on the care taken by the operator. This method also involves serious fire hazards, by reason of the explosive gasoline vapors during the drying process and also because of the large exposed tank of gasoline that is necessary. The danger of striking sparks either by friction or from electrostatic causes, as well as the hazards resulting from electric light and power wires, are considerable. The writer has investigated this subject somewhat with a view of adding materials which will largely reduce the fire hazard, and some interesting results have been secured along these lines.

Baking Japan

The second method employed to clean the metal surface prior to japanning consists in burning off the oils and grease with hot air. It has been found that a 12 min. exposure to a temperature of about 500 deg. F., in the presence of an excess of air, will entirely remove the oily materials without adversely affecting the surface. Naturally, the condition of the surface, weight of metal to be treated and many other factors, will enter to affect this operation. The data given above is based on sheet metal surfaces averaging about No. 14 gage. In this case the amount of oils and grease removed averages about 0.3 lb. per 25 sq. ft. of surface. The amount of air employed for circulation under these conditions may be determined on substantially the same basis as employed in the case of japanning practice. In other words, the concentration of vaporized oils should not exceed 1 per cent by weight of the air employed.

A third method sometimes employed uses a needle spray of boiling water or sometimes a large stream of boiling water under considerable heat.

Aside from the matter of compounding the japan, no single factor is as important as the baking process. There are many factors which require careful control in order to secure a durable, hard, elastic finish, having a good appearance. Some of the more important of these factors may be listed as follows:

- Time of baking,
- Temperature of baking,
- Temperature gradient,
- Uniformity of temperature,
- Air condition in oven.

To understand the relations of the above noted factors, a brief discussion of the action of the japan during the baking operation will be helpful. After the article to be japanned (which for purposes of illustration may be assumed to be an automobile fender), has been dipped in japan, the excess of liquid gradually flows from the surface (called dripping) until a fairly uniform condition has been secured. While in this state the fender enters the japanning oven (preferably carried by an automatic conveyor) and its temperature is gradually increased by the heat in the oven. The first effect of the increased temperature is to soften somewhat the layer of japan, due to the fact that the heat has a tendency to lower the viscosity. In case there are any pores in the coating this action allows them to be filled up. It also results in reducing the thickness of the coat, with the natural

consequence that its durability is somewhat reduced.

The softening of the surface layer is immediately followed, however, by the evaporation of a portion of the solvent, which in turn tends to harden the japan coating. This action continues during the baking period until the solvent is completely removed. At the same time, the linseed oil undergoes a process of polymerization and oxidation similar to the action in drying paints and varnishes. The presence of a large excess of air is of material assistance in hastening the oxidation process as well as in removing the benzine vapors, and thus hastening the evaporation of the solvent.

As the temperature increases further, the gums and resins begin to liquefy and then to give up certain more volatile constituents in the course of forming a hard condensation product.

It will be evident that the resultant product will have a different surface finish, depending upon the relative temperature of the japan and the surrounding air. In other words, if the japan (and the metal surface upon which it is spread) is warmer than the air about it, the polymerization of the oil and the hardening of the gums will take place more or less uniformly throughout the mass at the same time that the evaporation of the solvent is occurring. Under these conditions, the surface will be relatively free from microscopic pits which are sometimes noticed in poorly handled japan.

On the other hand, if the air surrounding the fender is warmer than the metal and japan itself, the surface of the japan will tend to solidify before the interior and even before all of the solvent has been evaporated from the japan layer. One result of this condition is the formation of tiny pores or holes caused by the evaporating solvent forcing its way through the outer layer or skin. These pores may be microscopic in size, but serve as a weak point at which the japan may be attacked by the weather. The pores also may serve to accumulate dust and dirt, thus causing the body of the automobile to have a very unsatisfactory appearance after a relatively short service.

From the foregoing description it will be evident that a means of heating the articles to be japanned, which permits of keeping them slightly warmer than the surrounding air, is desirable. To obtain such a condition appears to be impracticable for ordinary commercial work, but it can be more nearly approximated by supplying as much of the heat as possible in the form of radiant heat, that is, by radiation from hot bodies—in other words, the heating of a japanning oven exclusively by hot air, is not as satisfactory as heating by radiating surfaces. The most practical compromise, considering both the quality of the product and the cost of operating the oven, lies in supplying the necessary heat to raise the temperature of the metal and japan to the desired point, in the form of radiant heat, and at the same time heating the entering air to approximately the temperature of the oven.

Lower Temperature Preferred

As a general summary, it may be said that the lower the maximum temperature employed in baking the japan, the better will be the resultant surface. It will, of course, be evident that a reduction in oven temperature results in an increase in the time of baking, which, in turn, means either a materially larger investment in oven equipment or a correspondingly reduced production.

The japan manufacturers urge the lowest possible baking temperature and the longest possible time, speaking, of course, from the standpoint of securing a durable and generally satisfactory finish. On the other hand, because of the ever-increasing production demands, the tendency

of the automobile manufacturers has been to increase the temperature and decrease the baking time. Practice is widely variable in this connection and excellent results are secured with baking temperatures of from 450 deg. F. to 475 deg. F. on the one hand, and in some cases temperatures from 350 to 400 deg. are employed. A temperature of 450 deg. requires a baking period of about 45 min. to secure best results, although in some cases baking may be completed in a 30-min. period. Temperatures from 350 to 400 deg. require a baking time ranging from four hours to two hours to secure best results, although this may be materially decreased under some conditions.

The possibilities arising in connection with a quick setting japan are attractive and some surprising results have been secured. The writer also has given consideration to japans in which the solvent is water and the field opened up is both large and promising.

Temperature Gradient

Extensive tests, as well as theoretical considerations, indicate that the resultant surface will be improved if the baking temperature is increased gradually. The theoretical basis for this condition follows, of course, from the fact that the solvent will be given ample opportunity to evaporate before the polymerization of the oil and the hardening of the gums takes place. Several large japanning plants have equipment for "preheating" the material before subjecting it to the final baking. Steam coils, operated at temperatures ranging from 250 to 300 deg. F., are employed for this purpose. In spite of the theoretical advantages and those shown by tests, it is doubtful whether the preheating principle is of practical advantage and in the case of at least one manufacturer, equipment for this purpose already installed is not employed.

In case preheating is not used, the temperature gradient will be substantially a straight line, increasing rapidly to a maximum at the entering end of the oven (in the case of a continuous equipment) and continuing at the maximum temperature throughout the baking period. It is obvious that uniformity of temperature throughout the oven is of the utmost importance.

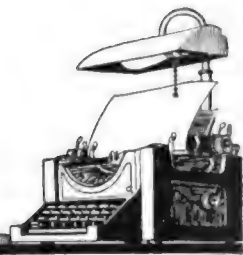
It is desirable that the air supplied to japanning ovens should be controlled in some positive manner, as natural ventilation should not be relied upon. It has been the experience of those plants relying upon natural ventilation to maintain the air circulation, that extremely variable results are secured. In these cases the ovens require constant supervision and the rate of production must be varied to compensate for weather changes.

It is unnecessary to remark that the air used for circulation within the japanning oven must be relatively free from dust and as dry as possible. In some plants the precaution of washing the incoming air has been taken, but this does not seem to be necessary under ordinary operating conditions. The advantages of preheating the air to oven temperature will be apparent when it is considered that this course tends to remove a portion of the lint or dust by burning and also materially increases the amount of moisture the air will absorb and thus, in effect, lowers the percentage of saturation.

To secure a high-grade finish, it is customary to apply at least one primer or "rubber coat," followed by from two to four finish coats. The primer coat is usually somewhat thicker than the others and carries most of the pigment (carbon black). The treatment, application and baking of the three coats is substantially the same as regards both time and temperature. The primer coat usually gives a dull or rough finish without hardness or brilliancy, these characteristics being supplied by the finish coats.



The FORUM



An Answer to Bolshevism

Editor, AUTOMOTIVE INDUSTRIES:

AT the battle of the Somme, when American Engineers threw down their spades, took guns off dead Englishmen and licked the living daylight out of the Kaiser's pet shock troops, they simply staged an advance sketch of what they are going to do to Bolshevism in this country.

You have heard it said that a lot of different antidotes could be applied to the invasion of this country by Russian Reds—but the *real* rock those whiskered fellows are going to bounce off is the brain casing of the American engineer—the man who always finds a way where there is no way. This country, as a whole, is a nation of engineers. There is no mechanical difficulty this country cannot solve when it must. Close down every foundry in America and some new mechanical way of doing what a foundry has to do would soon come out of the mind of some American engineer—I am using the word "engineer" in the broadest sense. We have in this country, word engineers, sales engineers, mining engineers, financial engineers—every kind of engineer. (An engineer is anybody who takes raw stuff and makes out of it finished product that does a new service of a needed sort.)

Suppose you stop all the mail trains in this country; how long would it take American business men to get to a point where everything would be transacted by wire, or telephone, or airplane? And if need be, some Yankee would rig up an outfit that would make it possible for a man to wiggle his wrist in New York and with this same wiggle sign a check in San Francisco.

There is nothing indispensable.

Not even American railroads.

We are getting more independent of our railroads every day—

Thanks to high-speed trucks.

THE MIDWEST ENGINE COMPANY,
LON R. SMITH, General Sales Manager.

Does Not Expect High Engine Speeds

Editor AUTOMOTIVE INDUSTRIES:

WE have not carried on any great experiments with our engines in regard to pneumatic tires, but, from such information and observation by customers using our product and from past experience, we are of the opinion that it is necessary to balance the vehicle speed with the engine speed in order to produce a truck that will give satisfactory service for a given length of time, which may be expected on such a vehicle. It is evident that the engine speed cannot be increased beyond the physical properties of the lubricating oils. Furthermore, the higher speed engines will wear themselves out in a great deal shorter time and prove unfit, so you can readily see that it would not be good practice to increase the engine speed to such an extent as to reduce the useful period of same, but it would be more logical to balance the engine speed with the vehicle speed of the truck, together with the physical properties of the lubricating oil.

The writer believes that the developments will bring forth a practice of holding down engine speed with increasing the vehicle speed, by changing the gear ratios and adopting the larger sized engine, for the engine is the most complicated part of the truck and which requires the greatest attention, and it cannot be operated beyond the physical properties, constituting the wearing qualities of any lubricating oil. It is for the above reason we feel that practice will dictate conservative engine speeds, with higher gear ratios for trucks used on average roads, and a greater series of intermediate gear ratios than are now used for pulling through soft roads and grades.

R. J. BROEGE,
Chief Engineer, The Buda Co.

No Departure for Pneumatic Truck Engines

Editor AUTOMOTIVE INDUSTRIES:

THE writer has been conscious of the comment concerning the effect of pneumatic tires on engine design; especially was this noticeable at the truck shows.

There seems to be a tendency to go to the extreme when any radical departure from present practices becomes popularized. It may be so with the appearance of the pneumatics.

Our company does not feel that there will be any change in their engine design, as its present characteristics make it most adaptable to the requirements of pneumatics, so far as speed is concerned.

A glance at the horsepower and torque curves will bear out the above statement, as the peak of the horsepower is shown to rise beyond the present recommendations for truck performance of 1000 ft. piston speed. In fact, for the 6-in. stroke engines, the peak comes at 60 per cent above this. This gives our engine the power and speed to drive its pneumatic tired trucks above the margin of safety for road travel without reduction in the gear or axle.

C. L. COLE,
Sales Manager, Wisconsin Motor Mfg. Co.

Germany's Aerial Losses

FIGURES which have recently been published in Germany go to show that the losses in the German air service during the war totaled 2483 dead and 3327 injured. These losses are made up as follows:

	At the Front.				In Germany.	
	Dead.	Injured.	Dead.	Injured.	Dead.	Injured.
	Acci- dents.	Fights.	Acci- dents.	Fights.		
Pilots	783	426	1,020	652	430	39
Observers .	176	305	312	425	49	32
Mechanics .	96	19	138	13	40	51

In addition, 159 student-pilots were killed and 247 injured in Germany during the war period.

Moulding Human Relations Out of the Theories of Labor Progress

In this series of articles, Mr. Tipper is patiently endeavoring to wake up the employer to the point where he will seriously attempt to reach a basis of understanding with his workers. This week he disposes of an objection that is commonly made whenever any labor change is broached.

By Harry Tipper

NOT long ago I was talking with a friend of mine over the lunch table. This friend has made quite a success of a compressed fiber that is worked up and used instead of wood for some purposes for which lumber was previously applied. The conversation turned upon the labor question, as it always does, and my friend said, "That's all right, Tipper, your ideas sound very logical but they are, of course, purely theoretical, and do you think the theoretical point of view is going to be of much value under present conditions?"

Having dealt me this blow, he leaned back in his chair prepared to see me vanish under the table.

Without replying to the question directly, I asked him how he came to get into this compressed fiber business.

Well, he said, "You see I had an idea there were a lot of purposes for which small lumber was used and to which purpose other fiber could be devoted more economically."

"But," I said, "I didn't know that you were in the lumber business at any time."

"I wasn't," he interjected.

"That's strange," I replied, "because if you were not in the lumber business, your idea must have been pure theory and you have just explained to me that pure theory is not valuable."

"Well, of course," he said, "the idea wasn't much good until I proved it in facts."

"True," was my answer, "but you could not have proved this practice and made a success of it without having had the idea in the first place. Now," I said, "let's go back to the labor question."

"When I first went into the shop many years ago to learn the practical side of mechanical engineering, as an apprentice, so to speak, I talked with union men with whom I worked and my observations of practices gave me an idea. All through that long experience in factory and construction work, working at the bench, training workers, supervising and superintending factory operations, I was busy collecting information on my idea and, at the same time, changing that idea just as you proved the practical possibility of your fiber idea and changed it to some extent in that process."

I mention this little incident because it indicates a general attitude on the part of men who have secured their positions as supervisors or owners almost entirely from experience. They have forgotten that, back of every growth, back of every discovery, and every improvement which has found its way into practice, there has been the theoretical idea upon which the experiments were based. They have forgotten also that, while the idea was the thing

which started them off, their own knowledge of engineering, or mathematics, or production, or marketing was not sufficient, and it was necessary for them to call to their service men whose education had been broader and more accurate in one or another of these branches of industry.

At the time the first experiment so occurred in connection with the explosive motor, the pure theory, that is the idea, of this kind of engine was already in the minds of a number of men. They were sufficiently sure their theory was correct that they were prepared to experiment with it and out of these experiments grew the practice.

Suppose each of those men had said to himself, theories don't amount to much, ideas don't mean anything, it is practical experience that counts, I don't have any experience in this line, I'll wait until the practice is established. We should be without an automotive industry to-day.

Our understanding in the field of human relations in industry is about where the understanding of the automobile was in those days except that, in the case of the originators of the automobile there was no problem, there was only the possibility of a great improvement. In the human relations development in industry, we already have a severe problem and are in the position where we must recognize it and take action on it so that the discussion of theory or ideas in relation to the human side is more important and the analysis of conditions more necessary.

In this case as in all other cases, the theory must precede the development of the practice. The idea must go before its practical application. We have not yet seen enough men among the industrial leaders who have been bold enough to experiment and wise enough to stay with that experiment to permit us to regard the present experiments as conclusive or to draw from them the significance of practical application.

I remember the statement of a very shrewd business friend of mine in the time when a few automobiles were toiling down Fifth Avenue occasionally. His statement was this, "I don't see much future for those things, they are too experimental, they don't work well, they are frightfully expensive and the old horse is much safer—we may have a repetition of the bicycle craze but nothing more."

Something of the same thing is being said now of those few who are bold enough to advance ideas or to conduct experiments in the hope of settling the human relations

problem in their industrial establishments. Many shrewd business men, seeing that the experiments work badly and are not efficient in their operation as yet, have concluded already that there is nothing in them and that they are a temporary fad which will speedily pass away. Other shrewd business men are convinced that they are dangerous, just as large sections of the public yelled against the automobile in the early days and at a still earlier period yelled against the introduction of the steam engine for the same reason.

As the problem presses upon us, however, more men will study it and more men will become bold enough to put their ideas into experiments and stay with these experiments long enough to see them consolidated into practice. What is good in the ideas will be retained and will be developed and what is of no moment will be eliminated in this process.

Of this we must be sure, however, that with many men in and out of industry studying this proposition, with large sections of the population interested in forcing our attention upon it, theories will continue to grow, experiments will increase and the justification of practice will gradually weed out those things which are not valuable and strengthen those ideas which are necessary to the solution of the problem.

But the matter which my friend brought up is a little broader than this and the habit of mind which suggested the matter is a great stumbling block in the way of development. We are constantly forgetting that all practices are based upon and developed from theoretical ideas and that it is just as important to study, analyze and evaluate ideas as it is to study the practice which follows from their eventual experimentation. It is all the more necessary in connection with human relations because there is at present no science of human nature and no set of text books which can provide a groundwork for comparisons in value. Furthermore, there is no basis of common ground between the man whose human expectations are limited to next week and the man who is required to think in terms of several generations.

It has been the historic method, in matters relating to human organization, to theorize for long periods of time before the theories eventuated in experiments and to experiment for equally long periods before the results of this experimentation have consolidated themselves into the practice of human organization. In some cases where the methods outlive their application to the human conditions too long, the experimentation only came by

way of revolution with its accompaniment of disorder. Without respect to how the changes in human organization methods occur, human nature develops very slowly in its forward march and for that reason there must be a much longer period of experimentation before conclusive evidence can be collected therefrom. It is for that reason also that wisdom in human affairs cannot be attained by the man who neglects development and who refuses to become interested in conditions which lie outside his own door.

The history of the development of industry in the last hundred years is a necessary preliminary to appreciating the tendencies and conditions of to-day while the significance of these conditions must be determined by theoretical analysis in the absence of sufficient experimentation. This theoretical analysis must be sufficiently clear in the mind of the industrial leader or manager to give him at least as much belief in its eventual value as the originators of the automobile business had in its practical possibility. Unless this is the case, he will be appalled by the difficulties of the experimentation and the patience necessary to consolidate it into actual practice.

Already, quite a few establishments, which were forced into experiments by the proximity of the problem, have allowed these experiments to lapse because they did not provide a solution for the first labor troubles which came along thereafter. The man who has been willing to spend a number of years in building a business to the point of practical profit, has stopped experimenting with changes for the benefit of his human relations within two or three months after they were started because they did not immediately prove themselves a financial success or wipe away all the human troubles.

It is the theoretical discussion of the labor problem to-day, coupled with the experimentations of those who are old enough to put their theories into operation which are the only hope in the solution of human troubles in industrial organization.

No progress can come without this theoretical discussion and without the experimentation from a purely theoretical basis. The idea must always come before the operation, in human affairs as in mechanical things, and the present discussion will be of immense service in clarifying our ideas in respect of the human relations in industry, if we are sufficiently patient to study them and interested enough to analyze them.

Rate-Cutting Fails in England

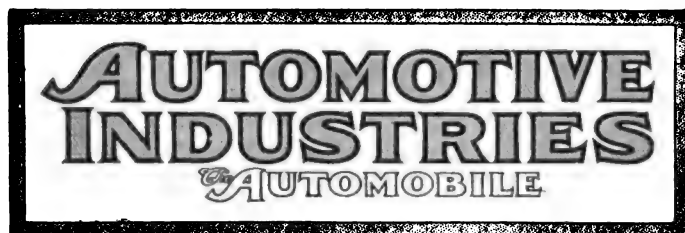
ALTHOUGH English industrial conditions differ from those of the United States in many respects so widely that they cannot be compared satisfactorily, there is one respect in which Americans well may profit by the experience of the British. Organized labor in England is definitely opposed to and is suspicious of piece work in any form, chiefly because employers introduced it in a haphazard manner and indulged extensively in the economic fallacy of rate-cutting. It is practically an accepted fact that British skilled workers can never be converted to accept the system now.

Far-sighted employers in this country have long ago abolished the twin evils of careless rate-setting and ruthless rate-cutting. The practice is still common, however, among many high-grade firms of the automotive industry. Probably no one factor goes further toward creating labor turnover and bitterness than the cutting of rates when a

man has reached a certain production level. The effect is not only to create dissatisfaction on the part of the workers, but to reduce materially the production.

A recent survey of typical automotive plants indicated very definitely that inefficient production and the rate-cutting evil almost always went hand-in-hand. The necessity for rate-cutting should never arise and it is not likely to when proper time-studies are made and when the time-study man takes the trouble to show himself to the workman as a friend rather than as an enemy.

The practice has caused so much trouble in England that the possibility of establishing satisfactory piece-work rates probably has passed. This possibility has not ended in America and the production and financial success of those factories operating their piece-work systems in a spirit of practical fairness proves the feasibility of a square deal in this particular.



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Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907, and The Horseless Age (semi-monthly) May, 1918.

Labor and Production

THE entry of the American Federation of Labor into politics brings about a rather unpleasant situation. The ideal would be for employers to welcome this activity on the part of labor but, of course, the employers, as a class, do not take such a view.

The chief aim of both the employer and the employed should be production and, naturally, all legislation asked by either should have that goal in view. Rather, the fact appears to be that labor believes that, in going into the political field, it is challenging capital (otherwise employees) on its own ground. Labor, in entering politics, will not gain its ideal, any more than past legislation has created the ideal. Not until both labor and capital have reached the point of a common understanding and a common effort to reach the goal of production will legislation approach a solution.

Employers are not now agreed on their needs. At a recent meeting of road contractors, there was a sharp division among these practical men on a point that is closely allied to legislation, but in reality is shop practice. Several speakers had referred with approval to the "bonus" system of wages. They

spoke of the general plan rather than of a particular one. But one of the most successful contractors raised an objection. He denounced everything except the flat wage. He called the "bonus" a bribery, and expressed the view that it should be so declared by law. And yet this man was not narrow; he merely did not see this particular point as did his fellows. Later, in talking on the present status of labor, he said:

"When, in years back, I loafed with laborers in bars or other places, I heard much boasting of 'How much work I did to-day.' Now I do not hear such talk. I hear mostly boasts of how little work the man did and how much money he got.

"Also, among employers and others, I used to hear much talk of the man who succeeded in raising 1,000 bushels of potatoes on three acres and little was said about the fact that he got only \$500 for his crop. Now you hear much of the man who raises only 500 bushels on that field but gets \$1,500 for the crop. The man who raises the money appears to be smarter, in the eyes of the people, than the man who raises the potatoes.

"Labor is not the only element at fault in the present situation. Probably we are all boasting of how little work we did to-day and how much money we got for it.

"We must get back to the other view. We must re-educate ourselves and in doing so we will educate labor. We must get back to production as a measure, not money."

And, when you think it over, this little talk about represents the situation. The lack of pride in achievement is not a monopoly to labor. •

Motor Haulage in the Large Cities

NUMEROUS interesting traffic problems affecting truck haulage in the larger cities came up for settlement in the studies preceding the reports of the state commissions for constructing the proposed vehicular tunnel between New York and Jersey City, the plans for which have just been submitted to the New York Legislature. The cost of the tunnel was estimated to be \$28,669,000 and it was believed that at least 12,000 tons of freight, principally carried by motor trucks, would be moved through the tube each day.

The report is of interest to the automotive industry for several reasons. One is that it reveals the present development of such traffic in Manhattan and points out the greatness of the future field of the motor truck. In its broader sense, it is indicative of similar conditions in other large cities, the magnitude of which is proportional to the size of each of the cities.

Furthermore, the studies involved in the report took up various phases of such traffic—the elimination from the tunnel of the exhaust gases of the machines, the grades necessary to permit successful operation and the dimensions of passageways that would allow all trucks to pass.

Ventilation, it was found, would be necessary so that the air content of carbon monoxide would not be

greater than three parts in 10,000. The heaviest grade was fixed at 3.52 per cent. The roadway dimensions were placed at 20 ft. width with a clearance of 13 ft. 6 in., although it was shown that the limitations of practically all traffic was no more than 12 ft. 2 in. for height and 8 ft. for width.

Such factors as those taken up by the report are necessarily of moment to the truck industry both of to-day and of the future.

Hunting for Trouble

THE numerous problems and difficulties which the manufacturer meets each day in the normal course of his business seem almost enough to keep him busy without his going about looking for trouble. When asked to make a report to the Government lately of his labor and production difficulties during the war, one manufacturer replied that he was too busy trying to run his business to write a report of his past troubles. This feeling is doubtless shared by other executives, who believe that their time is too much taken up with the current and immediate necessities of their business to spend much of it in thinking about past difficulties or looking for additional problems to solve.

Yet there is a definite necessity for hunting trouble. In the matter of labor, for instance, many manufacturers consider that they have no labor trouble as long as they are able, by one expedient or another, to avoid actual strikes and open hostilities. They are prone to regard labor trouble as an annoying fly to be brushed off with as little exertion as possible as often as it bothers them. One executive of an automotive concern said recently:

"We have had no labor difficulties. At one time two or three agitators appeared in our midst and tried to get up a strike but, as the men are on the whole more highly paid than any other employment here, the agitation died a natural death. The agitators were fired and no trouble resulted."

Such incidents should be viewed as a part of the whole problem of industrial relations rather than as a unit in themselves. It is only too true that ideas are more difficult to "fire" than agitators and, by failing to follow up the firing of the agitators with constructive efforts to gain the co-operation of the remaining workers, the management exposes itself to the danger of having labor trouble which is not apparent on the surface but which is none the less a hindrance to efficient production.

Strikes are the more virulent form of labor trouble; they constitute the breaking out of the disease. The modern industrial physician, like the modern medical man, should seek to establish preventive measures which would make impossible the actual outbreak of the disease. The acute stage of labor trouble, which takes the form of strikes and active demonstrations of similar nature, is not sudden and spontaneous. It is the result of long periods of minor difficulties which find no concerted expression on the part of workmen but which create an attitude toward the management and a spirit throughout the shop receptive to the ideas of the agitator and radical.

Consequently it is necessary for the executive to "hunt trouble." He cannot successfully adopt the policy of "never troubling trouble till trouble troubles him." A spirit of good will and co-operation among the workmen in any plant cannot be built up overnight, any more than an antagonism to the management strong enough to result in a strike can be built up in a similar length of time. If the management puts into operation a constructive industrial relations policy (while no surface indication of the necessity for it is apparent), seeds of discord, which may later be sown, probably will fall on fertile ground.

It is infinitely more difficult to create that spirit of co-operation and to make it permeate the whole works when the attempt is made merely in answer to a direct outbreak on the part of employees. Under such circumstances it is extremely hard for the management to convince the workmen that the effort is a sincere one and that it is not merely a forced measure thrown as a sop to keep production going.

It is true, unfortunately, that the already busy executive must go into his plant and find trouble before trouble comes to him, if the problem of industrial relations is to be successfully and satisfactorily solved.

Pneumatic Tired Truck Problems

THERE are some interesting engineering problems wrapped up in the design of the large capacity pneumatic-tired truck, and the sooner we get to the bottom of them the sooner we can expect a healthy development of this line of business. It is important that we get off to a good start in this matter, because if we do not we are apt to waste a great amount of effort and money and at the same time delay the realization of the benefits which this improved type of transportation can bring.

It is conceded by everyone who has gone into the matter that it is not possible to put pneumatic tires on trucks designed for solids and obtain the best results. There are a great many manufacturers who are either trying to do this or who are re-equipping old vehicles with pneumatics. However, to get the full benefit of the pneumatic tires, the truck has to be developed from the ground up.

It is not solving the problem to build a truck that will carry the load and make any grades that may be encountered. It is possible to do this and yet spend too much money for gasoline, oil and tires. Quite possibly the factors of safety necessary with solid tires are higher than those that may be used with pneumatics. The tire companies in their experiments have found it possible to cut these factors. A change in the factors of safety means a complete redesign of the chassis, and to successfully embark upon such a venture requires courage and money.

A study of the possibilities of the pneumatic-tired truck should readily supply the courage, and where this has been found and a careful analysis made, the money required for the development and marketing of pneumatic types should also be forthcoming.

Car Exports Grow—England and Canada Best Customers

January Figures Show \$832,927 Gain in Cars and \$232,171 in Trucks Over December—Gas Engine Shipments Show Resumption of Activity

WASHINGTON, March 3—A continued increase in the exports of automotive products is displayed in the export figures just made public for January, 1920, by the Bureau of Foreign and Domestic Commerce.

Passenger car exports for January numbered 7870, with a value of \$8,846,900, as compared with 7213, valued at \$8,013,973, for December, 1919, and 2173

cars, valued at \$2,916,381, for January, 1919.

Motor trucks likewise show a continued increase with 1721 trucks, valued at \$2,727,856, exported in January, 1920, in contrast with 1465 trucks, valued at \$2,495,685, for December, 1919, and 917 trucks, worth \$2,399,827, which were shipped in January, 1919. Motorcycle exports showed similar gains.

Gas engine exports totaled 7680, valued at \$2,514,552, for January as compared with 6512 engines, valued at \$2,128,358, shipped in December, 1919, and 6916 engines, worth \$5,096,307, shipped in January, 1919.

The United Kingdom was the largest single consumer of passenger cars and motor trucks, taking 1477 cars, valued at \$1,652,227, and 574 trucks, valued at \$886,205, with Canada second, and New Zealand, Brazil, Sweden, Japan, Peru and Uruguay buying in the order named; Sweden with 374 passenger cars, valued at \$541,029; Japan with 323 cars, worth \$365,955, and 99 trucks, valued at \$130,676, and Brazil with 400 passenger cars, valued at \$382,726, were unusually heavy buyers as compared with previous records.

Exports of Automobiles, Airplanes, Trucks, Farm Tractors, Motorcycles and Parts for January and Six Previous Months

JANUARY					7 MONTHS ENDING JANUARY 1920.			
	1919		1920		1919		1920	
	No.	Value	No.	Value	No.	Value	No.	Value
Airplanes.....			2	\$29,180	41	\$562,600	36	\$162,480
Airplane parts.....		\$77,331		43,060		9,217,112		215,266
Commercial cars.....	917	2,399,827	1,721	2,727,856	6,318	17,037,063	9,786	19,557,044
Motorcycles.....	541	142,084	2,398	664,288	4,241	1,018,766	16,365	4,513,391
Passenger cars.....	2,137	2,916,381	7,870	8,846,900	16,482	18,614,487	48,069	52,392,828
Parts, not including engine and tires.....		\$2,406,783		\$4,778,626		19,751,407		27,466,653

ENGINES					7 MONTHS ENDING JANUARY, 1920			
MONTH OF JANUARY								
	1919		1920		1919		1920	
	No.	Value	No.	Value	No.	Value	No.	Value
Automobile, gas.....	508	\$65,274	3,259	\$539,299	15,203	\$2,367,577	20,867	3,145,669
Marine, gas.....	513	290,504	657	182,497	3,327	1,787,363	5,339	1,912,586
Stationary, gas.....	1,998	330,224	2,058	291,821	13,555	1,907,499	15,562	2,096,982
Tractor, gas.....	3,897	4,410,305	1,706	1,500,965	12,323	14,024,784	10,353	9,150,949
Total.....	6,916	5,096,307	7,680	2,514,552	44,408	20,087,223	52,121	16,306,186

Automotive Exports by Countries

JANUARY				SEVEN MONTHS ENDING JANUARY, 1920				
	CARS		TRUCKS		CARS		TRUCKS	
	No.	Value	No.	Value	No.	Value	No.	Value
British Oceania.....			60	\$96,470			388	\$649,827
Denmark.....	87	\$82,515	21	42,749	1,633	\$1,393,887	452	983,552
France.....	28	128,619	22	44,760	586	794,700	1,282	5,522,841
Norway.....	82	126,010	35	75,694	1,343	1,690,923	484	970,953
Sweden.....	374	541,029			1,526	2,088,709		
Spain.....	117	159,466			1,088	1,368,540		
United Kingdom.....	1,477	1,652,227	574	886,205	6,817	7,262,208	1,429	2,145,841
Canada.....	578	712,220	130	237,403	4,899	5,808,396	1,118	1,870,106
Mexico.....	229	205,760	65	79,527	1,581	1,399,107	580	689,900
Cuba.....	266	307,769	83	188,010	1,949	1,997,366	583	1,255,227
Argentina.....	228	306,602	25	21,672	1,355	1,642,362	102	173,683
Chile.....	49	82,461			119	186,664		
Uruguay.....	294	241,250			1,069	1,010,974		
British India.....	189	189,378			2,124	2,294,840		
Dutch East Indies.....	236	270,911	76	161,979	835	1,041,840	204	434,132
Japan.....	323	365,955	99	130,676	1,323	1,278,966	319	412,332
Australia.....	107	140,192			2,287	2,449,552		
New Zealand.....	439	480,017			2,325	2,603,948		
Philippine Islands.....	348	325,187	62	114,003	1,358	1,471,742	364	526,657
British South Africa.....	262	299,914			3,296	2,564,611		
Brazil.....	400	382,726			2,679	2,075,290		
Peru.....	294	241,250			1,069	1,010,974		
China.....	126	149,677	8	14,281	449	586,235	101	270,197
Other countries.....	1,529	1,680,680	461	634,427	7,933	8,555,015	2,375	3,652,096
Total.....	7,870	\$8,846,900	1,721	\$2,727,856	48,069	\$52,392,828	9,786	\$19,557,044

Ford Admits Plan to Build Dirigibles

DETROIT, March 9—Ford Motor Co. officials to-day admitted that the construction of dirigibles for the navy was contemplated by the company. Col. Sidney D. Waldon, chairman of the Board of Commerce, aeronautical committee, and former vice-president of the Packard Motor Car Co., also stated that dirigible construction had been considered in Detroit since last June, when the arrival, landing and departure of the British dirigible R-34 was witnessed at Mineola by the Board of Commerce Committee and other influential Detroiters, headed by Ford.

"A delegation from the Navy Department visited us and said they looked to Detroit because of our confident way of doing big things," said Colonel Waldon. "As a result of their visit the trip to Mineola was planned and the Ford project was the direct result."

At the office of W. B. Mayo, chief mechanical engineer for the Ford Motor Co., it was said the matter was under consideration, but it was declared no definite steps looking to the utilization of River Rouge plant had been taken. It also was denied that Ford had given Mayo instructions to look into the adaptability of the River Rouge plant for dirigible construction.

Dispatches from Washington which prompted the admission from Mayo's office, were to the effect that Ford plans to build a plant and construct a 1000-ft. dirigible without cost to the Government until the ship is accepted. It also was said a Ford agent now is in Germany to purchase a German dirigible and plans for a model.

During a visit of Secretary of the Navy Daniels to Detroit in January he discussed the matter with Ford and visited the River Rouge plant to inspect the facilities for dirigible construction.

TARKINGTON BUILDS UNIT

ROCKFORD, ILL., March 9—The Tarkington Motor Co., Rockford, has let the contract for a new factory building to cost \$75,000. The building will be of brick, 78 x 500 ft. It is expected the structure will be ready by July 1.

British Market for Heavy Trucks Closed

Expert Says War Trucks Will Meet All Demands for Several Years

DETROIT, March 6—Timely warning to American manufacturers who had visions of a market in England for heavy trucks is sounded by Samuel A. Wallace, mechanical transport director for London, and Ford distributor in Europe's metropolis. A large market is available for the two-ton truck, but the "closed season" has been pronounced by Wallace on anything heavier than three-ton models.

Wallace is frank in his statement that American products of the heavy type will be barred, relying on the self-preservation adage in support of his stand.

"You see it's just this way," said he. "We have at the Slough (a great war repair depot near London) 50,000 army trucks that must go back into industry. That will mean at least two and a half years. Of course we are not going to permit foreign manufacturers to break into our limited field while we are disposing of that left-over material. There is a market for at least 200,000 two-ton trucks, but we have a corner on the heavy type."

The 50,000 trucks referred to by Wallace were built for the British army and the armistice left the government with what looked to be a white elephant on its hands. It was then officials turned to Wallace, who, as head of the Associated Equipment Co., built a majority of the trucks purchased for war service by the government, and he was made director general in charge of all repairs and reclamation of property from France being assembled at the Slough, chief among which were the heavy type trucks.

So successful has been the effort under his direction that the trucks being placed

on the market are equal if not superior to the product direct from the factory. This, coupled with the fact that the price is so low as to preclude the possibility of American competition, gives officials at the Slough confidence in their stand against importations of heavy trucks.

Aside from the fact that Americans are warned against an attempt to create a market in England until the left-over product of the war is disposed of, the type of streets in London and throughout England, in the opinion of Wallace, restricts the market. Streets are so long and narrow, he said, as to make it virtually impossible for trucks of long wheelbase to get into freight houses. Constituting the bulk of the haulage, in- and out-bound freight, therefore, is the problem and can be solved only by the shorter and lighter truck.

Seeks Bus Improvements

Aside from his duties as director of mechanical transport and director of operations at the Slough, Wallace is interested heavily in British enterprises, and a short time ago took over the London Ford service depot at Brook Green, Hammersmith, and control of Ford distribution in London, at a cost of approximately \$1,000,000. Associated with him in this is C. F. Lumb. Wallace, whose visit to America was designed primarily with the idea of looking up improvements for the London motor buses, spent several days at the Ford plant.

Wallace predicts the time when a tire change will be but the matter of thirty seconds, or thereabouts. The problem of successful transportation, he said, lies in getting the public to its destination without delay. "The public does not care about your bus or your problems," said he. "The patrons have a definite object in view when they enter a bus, and their demand is for quick and safe transportation to a given point. The time must come, therefore, when a punctured tire or a blowout will be jerked off and a new one substituted with no appreciable delay to traffic."

Minneapolis S. A. E. Discusses Bearings

Representatives of S.K.F., Timken and Hyatt Discourse Merits of Respective Types

MINNEAPOLIS, MINN., March 4—The dinner of the Minneapolis S. A. E. Section to-night for the discussion of anti-friction bearings resolved itself into a three-cornered battle participated in by representatives of the S. K. F. Industry, Inc., the Timken Roller Bearing Co. and the Hyatt Roller Bearing Co. The three types of bearings discussed were ball, taper roller and straight or plain roller. F. J. Rider and J. B. Castino were the spokesmen for the S. K. F. organization, while the Timken and Hyatt products were explained by T. V. Buckwalter and Otto William Young.

Each speaker began his talk with a general description of the particular bearing type his company made and followed this by citing specific instances of applications in cars, trucks and tractors. While none of the speakers came out point blank to the effect that this type of bearing constituted the highest development possible for any design requirement wherein anti-friction bearings are involved, it was easy to see that none was going to cede ground as to relative merits without contest.

There was little time for a general discussion, the entire evening being devoted to talks and rebuttal by the speakers. Practically speaking, no final decisions were reached, and A. William Scarratt of the Minneapolis Steel & Machinery Co. relieved the tension of the meeting by stating that to his mind the bearing question was greatly influenced by design and production of whatever piece of automotive apparatus the bearings were going into. Thus, a tractor, for example, would be designed to meet the requirements of ball bearings in all its parts.

Major Schroeder, Altitude Record Holder, and His Le Pere Plane



These photographs were secured at McCook Field a few hours after Major Schroeder made the new altitude record of 36,020 ft. on Feb. 27. The Moss supercharger, which is credited with having made the record climb possible, is visible just above the propeller hub. It was designed by Dr. Sanford A. Moss and supplied by the General Electrical Co. The plane is a Le Pere type built at the Packard factory

Accessory Makers Association Plans Advertising Council

**Preliminary Meeting of All Advertising Managers Set for March 26—
Council Would Study Costs and Effects of Campaigns
and Strengthen Weak Points**

NEW YORK, March 6—The Motor & Accessory Manufacturers' Association has called a meeting of advertising managers and executives of companies belonging to the association for March 26, to consider the advisability of organizing a permanent advertising managers council to function as a central clearing house for constructive co-operative work on advertising problems as they affect the automobile industry.

It is planned to have two or three speakers of national prominence to give brief talks. The first meeting will be in the nature of a preliminary get-together business session.

In calling the meeting H. L. Hemingway, general manager, said:

"A careful study of the advertising phases of the automotive parts and accessories industry indicates that there is a broad field for practical and genuinely valuable work by a council of advertising managers and executives within our association. This should not in any real sense duplicate the work done by the many local and national advertising clubs and associations. On the contrary, it seems desirable, and in some respects essential, to supplement and strengthen these more general activities by bringing together those advertising executives whose problems are substantially the same."

The following are a few of the more important problems definitely presented for the attention of the council:

1. A study of the function of the advertising agency and its value to the advertiser.
2. The determination of the amount of advertising appropriation and the allotment for the various forms of advertising.
3. The relation between sales and advertising departments.
4. Furnishing of dealer helps, electrotypes and advertising literature to dealers.

Would Train Advertising Men

5. The training and development of advertising personnel.
6. New tendencies in the technique of automotive advertising in copy, art work and layouts.
7. The sharing of advertising expense with the dealer.
8. The problem of newspaper publicity sent out by the factory and by the dealer—co-operation with the trade press and with the automobile editors of the metropolitan newspapers.
9. Counting the cost and gaging the result of your advertising.
10. Advertising and sales problems in relation to the automobile shows and exhibitions.

11. Representation in and co-operation with general advertising organizations of national scope.

12. Miscellaneous plans for the elimination of waste in advertising, for reducing costs, for co-operation economy and for improvement and standardization in automobile advertising.

13. Advertising for foreign trade.

It is planned to have a council of advertising managers function through the general offices of the Motor & Accessory Manufacturers Association which will probably inaugurate for this purpose an advertising bulletin service going directly to the advertising managers and directly to members of companies.

These bulletins will cover all advertising matter of interest to the automotive industry and will constitute a medium for the continuous exchange of ideas and experience on important advertising problems.

Commercial Future of Airplane Is Discussed

NEW YORK, March 11—Commercial airplaning, as a science and an industry, is vital to the military and economic welfare of this country, according to the speakers at the S. A. E. Aeronautic dinner at the Hotel Astor last night. This idea was closely adhered to by all speakers and they represented engineering, army, navy, manufacturing and sales. The military men were especially insistent that their development of the airplane as a means of defense would be worth little in a time of danger if the commercial use of airplanes did not develop an industry that would supply the planes and personnel for emergency expansion. The applause of the diners indicated approval of this sentiment.

There was another development of interest on the question of a separate department for military aeronautics. Both Gen. C. T. Menoher and Commander Westervelt represented the army and navy as favoring the development of aeronautics within these two departments. Col. Truman H. Bain, called upon without warning, let it be known that he favored a distinct military department that would work out all defensive problems.

Col. Jesse G. Vincent, president of the S. A. E., presided. The first part of his address was to review the development of the S. A. E. and to appeal to the membership to study carefully all questions presented, as they must recall that the society held a position of power and respect which it must maintain.

Col. Vincent announced that Otto E. Praeger of the Postoffice Department was to have been a speaker but was

detained because of illness in his family. In the absence of the expected speaker, Col. Vincent outlined why, in his opinion, mail carrying was the logical employment for airplanes for development of the industry and science, not the least of which was the fact that experience had proved that the present day planes could be operated at or near a profit in this work.

Col. Vincent introduced Glenn Martin as toastmaster. Martin modestly refrained from referring to his own accomplishments in any way but showed a detailed acquaintance with aeronautical language in introducing the speakers. Gen. Menoher described the tactics now outlined for use in the event of a future war. Commander Westervelt told an interesting story of the first flight of a 12-cylinder engine and outlined frankly the type of craft the navy seeks to develop and asked the engineers to think of the problems presented.

George H. Houston reviewed the commercial situation from a manufacturer's standpoint and asked the engineers to give their attention to problems of safety and economical maintenance. Major Maurice Connolly, who this week became a salesmanager, spoke for the sellers. He dwelt on the idea that it was necessary to sell dealers on aircraft as a future development and make each dealer a worker for the promotion of public sentiment. Commodore Charleton, the British Aircraft Attache at Washington, was an unannounced speaker. He said that the entire world needed to be educated in the possibilities of aircraft.

Changes in Dodge Staff Are Announced

DETROIT, March 8—Announcement that Arthur T. Waterfall, traffic manager of Dodge Brothers had been promoted to director of traffic, with Preston G. Findlay, freight traffic manager of the Michigan Central as his assistant, effective March 15, forecasts the further announcement that E. J. Haynes, purchasing agent, has been made vice-president and general manager. Formal announcement of the new organization is expected as soon as Horace E. Dodge returns from Florida.

Extend Filing Date on Incomes to May 15

WASHINGTON, March 6.—Corporations have been granted an extension until May 15 as the final date for compiling income tax returns for the calendar year of 1919, by the Bureau of Internal Revenue. Tentative corporation returns must be filed for the calendar year 1919 on or before March 15, 1920. Each return must be accompanied by at least one-fourth of the estimated amount of the tax due, together with a statement setting forth the reason why the return cannot be completed within the prescribed time and a formal request for the extension. Any deficiency in the first installment will bear interest at the rate of 6 per cent.

Harley-Davidsons High in French Test

Take Five Places in Side-Car Class—English Cycles Lead French Makes

PARIS, Feb. 20 (*Special correspondence*)—Out of 70 motorcycles which left Paris for the 1000-mile reliability trial to Nice, only 45 reached the destination under the conditions laid down by the rules.

French machines were in a minority, but they never showed up very brilliantly, for, with the exception of the 250 cc. light class, they only won one first prize.

These trials were based on regularity, hill climbing, silence and brake tests. The highest number of points was won by an English Zenith machine, with a 154.92 out of a possible 200. The best team performance was made by the English Scott machine, which won the President de la Republique prize, and secured second, third and fourth places in the 750 cc. class. These machines are two-cylinder, water cooled, 2-cycle type, and although well known in England ran in France this year for the first time.

The American industry was represented by Indian and Harley-Davidson. The latter, in the sidecar class, finished first, second, fifth, sixth and seventh. One out of the two Indians finished the run, securing the fourth place in its class.

The performance set up by cycle cars was not brilliant, only one remaining in the competition at the end. This was an English Morgan. Other cycle cars, including machines of this make, dropped out during the competition.

The roads from Paris to Nice were exceptionally bad and, although the average speed was only 18½ miles an hour, it was necessary on one of the stages to give the competitors an extra half-hour in order to reach the control.

Official Results of the Trials

250 cc.	
Motosolo, Dubost	127 points
Motosolo, Dupont	93.7 points

350 cc.	
Connaught, Greenwood	141.95 points
Douglas, Colombel	138.75 points
New Imperial, Horton	129 points
New Imperial, Rigal	118.32 points

500 cc.	
Rover, Barthelemy	150.8 points
Sunbeam, Tom Gilles	139.97 points
A. B. C., Detruche	135.6 points
Triumph, Gallie	117.17 points
Sunbeam, Rutherford	98.90 points
Sunbeam, Newman	98.90 points
Blériot, Brunet	68.04 points

Sidecars, 500 cc.	
Georges Levy, Gulnet	125.52 points
Sunbeam, White	125.3 points
Rover, Rex Mundy	95.06 points
Rover, Psalty	74.04 points
Benoit Gouin, Gallien	51.82 points

Sidecars, 750 cc.	
A. I. S., Douglas Hanker	135.52 points
Triumph, G. Perry	132.7 points
Georges Levy, Noret	131.13 points
Georges Levy, Lacour	128.8 points
Norton, Horsman	128.7 points



Winners in the Paris-Nice Contest

Upper—Two Harley-Davidson machines that won first and second prizes in their classes. Lower left—Indian which finished fourth in the 1000 cc. class. Lower right—Zenith, credited with highest score in the trials

Stucchi, Delaunay	87.05 points
Georges Levy, Gompertz	85.7 points
B. S. A., Dupuis	70.3 points

750 cc.	
Zenith, Kay Don	154.92 points
Scott, W. C. Guy	149.3 points
Scott, Jesse Baker	144.5 points
Scott, Tom Wood	139.6 points
Triumph, Pinney	136 points
Rover, Dehay	133.8 points
Triumph, Goffrey Hill	109.04 points
Sunbeam, Sermens	104.71 points
Scott, O. Wood	98.56 points
Scott, Russell King	86.03 points

Sidecars, 1000 cc.	
Harley-Davidson, Verpault	146.13 points
Harley-Davidson, Bonnard	136.6 points
Royal Enfield, Oblin	133.8 points
Indian, Etade	132.34 points
Harley-Davidson, Collot	130.9 points
Harley-Davidson, Mulliman	120.49 points
Harley-Davidson, Pletsier	112.1 points
Matchless, Dellané	105.9 points

Cyclecars, 1100 cc.	
Morgan, Chapman	144.5 points

DU PONT BUYS PLANT SITE

WILMINGTON, DEL., March 6—The du Pont Motors Corporation, manufacturer of the new du Pont automobile, has bought 8½ acres of land at Moores, Pa., between Wilmington and Philadelphia, where a plant will be erected for the manufacture of cars.

The company will retain the plant here, where the first cars were made, for the manufacture of automobile and gas engines.

Raw Materials Lead in January Imports

Both Branches of Foreign Trade Show Large Increases in January

WASHINGTON, March 6. — The foreign trade of the United States during January, 1920, showed large gains in exports and imports, with the latter increased considerably more than the former. Imports for January, 1920, totaled \$473,904,053, as against \$212,992,644 in January of last year, an increase of more than 100 per cent. Export figures for January totaled \$732,745,493, as compared with \$662,552,783 in January, 1919.

The greatest increases in imports were noticeable in crude materials for manufacturing purposes, which totaled \$77,757,987 in January, 1919, as against \$25,477,159 in January this year. Foodstuffs and completed manufactures ready for consumption show comparatively large gains in the imports.

Crude materials for use in manufacturing made the greatest gain in the exports with a total of \$237,477,548 ex-477,159 in January this year. Foodstuffs \$137,769,968 in January, 1919. Manufactured articles ready for consumption increased slightly.

Service Managers Division for N.A.C.C.

H. R. Cobleigh to Head New Department—Will Aid in Standardizing Practices

NEW YORK, March 5.—The National Automobile Chamber of Commerce at a meeting held recently voted for the establishment of a service managers' division to function for that department along similar lines to the foreign trade, patents, traffic, legislative, highways and other departments. H. R. Cobleigh has been placed in charge of this new division. It is the intention to arrange for meetings or conventions of factory service managers, planning programs, securing authors for papers and discussing topics of interest and value to the industry.

It will be remembered that the first factory service managers convention was held in Detroit in November of last year and the action of the Chamber a few days ago is simply carrying out the ideas promulgated at that meeting. Many activities will be fostered and bulletins will be mailed to service managers calling their attention to practices needing correction, policies worthy of universal adoption and special efficient systems in use by certain successful factories.

Following the success which attended the visits to member factories at the Detroit convention it is planned to continue such visits and to prepare publicity material to further the efforts of factories to furnish satisfactory service.

The Chamber will co-operate to the fullest possible extent with the National Automobile Dealers Association, Motor and Accessory Manufacturers Association, other national associations and the Motor Transport Corps on all matters pertaining to service.

To Conform School Methods

The Chamber will be of material assistance to branches and dealers by encouraging and assisting in the establishment of local organizations, of dealer and garage servicemen. Wherever possible this division of the Chamber will provide speakers and indicate the direction in which factory and dealers service departments may co-operate to improve the character of service.

A very important work will be in the visiting of great numbers of automobile schools with the intention of standardizing methods to a considerable extent. The division will prepare manuals, based upon research through the field to show how the more common repairs and overhaul operations can be handled with a minimum of time and material. This will not only include the quality of service but will reduce the cost to the service station so that the profit will be greater or the charge less.

This division will also act as a central bureau for the collection and dissemination of information to help other service bureaus and associations in the conduct

of their work. It will act as an employment clearing house whose primary object will of course be the assisting the factories but whose work may also be extended to dealer establishments.

With the realization on the part of the manufacturer, designer and dealer of the importance of service work, this step on the part of the Chamber may be considered as highly important.

Portugal Forbids Importation of Cars

PARIS, March 6 (*Special correspondence*)—The importation of passenger cars into Portugal has just been forbidden by the Portuguese Government, and a limit has been placed on the number of trucks which can be taken into that country.

This decision will disturb principally French and American makers, who had orders in hand for Portugal. It is declared that French makers had received orders for automobiles to be delivered this year to the value of \$3,000,000 and that a deposit had been paid on all these orders.

DELAWARE INCORPORATIONS

WILMINGTON, DEL., March 6—The following corporations have been chartered under the laws of Delaware:

Ad-Mor-Myler Rubber Co., with a capital of \$1,000,000, to manufacture rubber appliances. The incorporators are M. L. Harty, M. C. Kelly and S. L. Mackey, all of Wilmington.

Pennsylvania Automotive Corporation, with a capital of \$50,000, to manufacture and sell automobiles. The incorporators are W. N. Lofland, Frank Jackson and Mark W. Cole, all of Dover, Del.

United Tire Stores Co., Inc., with a capital of \$10,500,000, to manufacture and sell tires, etc. The incorporators are T. L. Croteau, M. A. Bruce and S. E. Dill, all of Wilmington.

Republic Truck Sales Corp., with a capital of \$100,000, to manufacture and sell motor trucks, etc. The incorporators are T. L. Croteau, M. A. Bruce and S. E. Dill, all of Wilmington.

SUNBEAM ENTRIES PLANNED

NEW YORK, March 6—Arrangements for the participation of a Sunbeam team to represent Great Britain in the international 500-mile sweepstakes to be run on the Indianapolis Motor Speedway, May 31, will be made by Dario Resta. Sunbeam representative in the United States and noted racing driver, who is to leave for England in the near future.

Last year the Sunbeam entries were declared ineligible to compete owing to a technical error in building the engines oversize.

CASE ADVANCES PRICES

RACINE, WIS., March 8—Effective to-day, following are the new prices on Model V 6-cylinder Case cars: 7-passenger sedan, \$3,750; 4-passenger coupé, \$3,400; 7-passenger touring, \$2,650; 4-passenger sport, \$2,650.

British Production On Upward Trend

Materials Assembled During Molders Strike Aids in Present Healthy Showing

LONDON, March 6 (*Special correspondence*)—About four weeks have passed since the molders resumed work after a strike lasting some fifteen or sixteen weeks. The result is being seen in an improved output of vehicles, though something, probably most of the credit, is due to there being on hand (accumulated during the strike) stocks of finished components and pieces other than castings. It remains to be seen if the output can be continued at the present promising rate, especially in the case of firms which up to now have ruthlessly neglected all suggestions of getting parts from specialists.

The Harper-Bean group has hit on the interesting idea of publishing a record of each month's output, which probably has been told them by Mr. Conroy (formerly of Willys-Overland), the new production organizer at the Harper-Bean main factory. The output for January was 286 chassis, which is accounted about 25 per cent more than was scheduled in the prospectus of the company's recent \$30,000,000 flotation. The factories concerned are the Harper-Bean works at Tipton, the Vulcan at Southport, and the Swift at Coventry.

Nominally this output averages 70 a week between these three works, and despite the company's remark as to its being 25 per cent more than was expected, it is obvious that it is about only 25 per cent of the output required to justify the \$30,000,000 capital involved in these and the subsidiary "feeder" factories of the combine. Reports are that Conroy has done wonders at the Bean works in a short while, where he has had to install both new plant and a modern system of progress output.

Meanwhile the Austin company is in the market for a further \$7,500,000 capital for financing output, etc. This company's total capital available to be called up is \$25,000,000. Production is improving at the works, but at present it is nothing like sufficient to meet the changes in capital. The new prospectus for further capital makes no reference to the position of the recent negotiations between General Motors, Ltd., and the company. Possibly the result of this flotation as a measure of public confidence will settle the issue.

COMPLETES BODY PLANT

LUDINGTON, MICH., March 5—Monroe Body Co. rapidly is getting into shape for production in the building formerly occupied by the Cartier-Chapman Wagon factory. A modern factory building will be erected alongside the temporary plant, as rapidly as the work can be rushed. Three carloads of machinery for the plant arrived in Ludington this week. R. F. Monroe, general manager already has enrolled 150 experienced workmen.

New Handley-Page Continental Routes

London - Paris - Brussels Freight Route Is Established for Valuable Consignments

PARIS, Feb. 4 (*Special correspondence*)—Since the London to Paris and Brussels air services were established on Sept. 2, 1919, until Jan. 29, 1920, Handley-Page machines had carried 924 passengers, 43,412 lb. of freight, and had covered a distance of 65,293 miles.

On May 1, 1919, civilian aviation was established in Great Britain, and from that date until Jan. 29, 1920, Handley-Page machines carried 461 passengers, 44,805 lb. of freight, and covered 74,743 miles.

A new service has recently been established between London, Paris and Brussels for carrying freight at reduced rates. The following is the scale of charges:

Shipments up to 10 lb.....	*2/6 per lb.
Shipments from 10 to 20 lb.....	2/3 per lb.
Shipments from 20 to 50 lb.....	2/- per lb.
Shipments from 50 to 100 lb.....	1/9 per lb.
Shipments, 100 lb. and over....	1/6 per lb.
Passengers' baggage (unaccompanied by passengers).....	1/6 per lb.
Minimum	5/- per lb.

(*At English rates. Shillings equivalent to 25 cents and pence, 2 cents.)

Many valuable consignments have been sent by air between London and Paris during the past weeks. On one occasion a Handley-Page machine carried \$17,500 worth of jewels from London to Paris. Among these was a necklace valued at \$11,500. Precautions were taken to safeguard the jewels in the event of a forced landing between London and Paris.

Numerous consignments of delicate articles, such as ladies' silk dresses, scientific instruments, antiques, valuable flowers, are now constantly carried by air between Paris and London. Air service is proving itself particularly valuable for this class of transportation, for all danger of damage by rough handling is removed, and the risk of loss by theft becomes negligible.

The Handley-Page Co. is now making use of converted bombers for continental air service. These machines are known as Type W-8, and carry 15 passengers or 2 tons of freight at a speed of 112 miles an hour. The first of these machines was exhibited at the Paris Aero Show, having been flown there from London. On the close of the exhibition this machine was flown back from Paris to London, making the flight in 2 hours 10 minutes. The average time between Paris and London is under 3 hours by air; by train and steamer the journey often occupies 14 hours.

PERU DEVELOPS AVIATION

WASHINGTON, March 6—The President of Peru has published a decree creating a school of military aviation in Peru, and twelve French planes were received in Lima about a month ago. Representatives of both English and American com-

panies are in Lima at the present time, and the purchase of two American planes has already been made by the employees of the Empresas Electricas Asociadas, who seem to have taken the initiative in promoting aeronautics. Recent accidents to both the French and American demonstrators may retard the negotiations for additional airplanes.

It is also reported that the Peruvian Corporation intends to inaugurate a flying boat service between Callao and the summer resort of Ancon, 25 miles to the north. Planes manufactured by Handley-Page are to be used for this service. Flights will also be made between Callao and Salaverry, a distance of 260 nautical miles, by steamer route, which the flying boats can cover in approximately 3 hours. It is expected that considerable traffic between Callao and outlying ports will develop.

Navy Starts Work on Trans-Pacific Airship

PHILADELPHIA, March 6—The construction of the world's largest dirigible airship, which navy officers at the Philadelphia Navy Yard, League Island, believe will make the first non-stop flight across the Pacific Ocean, will be begun soon, the designing to be done at League Island. It will be developed along lines similar to the R-34 which made the successful trans-Atlantic flight. Fifty-two experienced draftsmen have been called for. The dirigible will weigh approximately 33 tons and will have a carrying capacity of 30 tons.

TO OPEN DELAWARE HIGHWAY

WILMINGTON, DEL., March 6—The Delaware State Highway Department expects to have the state highway, from one end of Delaware to the other, 100 miles, with a number of connecting roads, completed by the end of this year. Much work was done last year, when the real start was made and additional contracts will be let in March for large projects this year.

In order to distribute the traffic over the new roads the Highway Department has arranged to keep the roads free of snow in winter as far as possible, at all events where there is heavy traffic. The roads are policed also, to prevent excessive speeding and other abuses.

CONRADSON TOOL EXPANDS

GREEN BAY, WIS., March 8—The Conradson Machine Tool Co., Green Bay, Wis., is effecting a large increase in the output of selective head turret lathes by doubling the working force of its plant, erected last fall. The output of milling machines and radial drills also is being enlarged materially. The entire production has been contracted for by Joseph T. Ryerson & Sons Co., Chicago, which has established an office in Green Bay. For the present the miller is being manufactured under contract by the Green Bay Barker Co., and the drill by a concern at Marquette, Mich., until the Conradson plant is enlarged sufficiently to accommodate both operations.

Blames Railroads for French Inertia

Industrial Delays Due to Transportation Facilities Says Michelin—Favors 8-Hour Day

PARIS, Feb. 20 (*Special correspondence*)—The lack of railroad transportation is the main reason for the slowness with which France is getting back into production, according to a statement made by M. André Michelin, head of the Michelin Tire Co., in an article written for the French paper the "Journée Industrielle."

M. Michelin says that the French railroad material is in a very poor condition at the present time. The train service has never been so bad, and there has never been so much indifference among the railroad workers. There would be no shortage of finished goods if the railroad service were satisfactory. The Michelin Tire Co. would be in a position to meet all requirements if the railroad service was capable of handling the goods ready for delivery.

According to M. Michelin, not only is the material in poor shape, but there is a shortage of skilled workers, and many of the heads of departments are inefficient. One of the reasons for this is the uncertainty regarding the future of the French railroads. Young engineers hesitate to enter a service which in the near future may become a branch of the State departments.

As an instance of this, the Michelin Co. was informed one evening that a freight car was in the depot for them, waiting to be unloaded. When they went the next morning to take delivery of this car, they found that it had gone. This car possessed good brakes, and in consequence, it was used on five long distance trips without being unloaded before the Michelin company could get delivery of it. Such instances are common.

Eight-Hour Day Coming

The eight-hour law is not a mistake, declares M. Michelin, and with proper organization efficient service can be obtained from an eight-hour day, or even in certain cases from a six-hour day. Modern American methods have been experimented with in the Michelin Tire Co. main factory at Clermont-Ferrand, when it was found that with modern and highly efficient machinery, the workers unless specially trained found themselves under a serious handicap. Some of the workers had stated that they would prefer to work longer hours at a less strenuous rate. This is only a question of education and training in order to enable the workers to keep pace with modern machinery.

The fact must be faced that rest centers, such as are known in America, must be available for workers, in order that they may make intelligent and healthy use of their hours of recreation. In order to be advantageous the new methods of work must be accompanied by a long series of reforms.

Would Settle Labor Disputes at Source

Industrial Conference, Completing Studies, Suggests Settlements at Individual Plants

WASHINGTON, March 8—The proper place to grapple with the labor problem is in the individual plant, the second industrial conference will tell President Wilson in its final report. The conference adjourned Saturday after having held eighty sessions since its first meeting, Dec. 1. Its report, adopted unanimously, will go to the President next week, and will be made public within fifteen days.

Specific recommendations regarding hours of work, wages, women and children in industry, unemployment and similar problems have been made, the conference announced, and a definite stand on collective bargaining, the rock on which the first conference came to grief, has been taken.

In a preliminary report made public Dec. 19 the conference proposed machinery for adjusting disputes between employees and employers and asked for criticisms and suggestions. A number of men prominent in public life, as well as representatives of capital and labor, appeared before the conference, while individuals and organizations made suggestions in meeting.

The final report, the conference announced, makes some modifications of the organization suggested in its preliminary statement, but leaves intact the national industrial board and the regional boards of inquiry and adjustment. The final report also deals "broadly with the general field of industrial relations" and undertakes to prevent industrial disputes by recommending elimination to facilitate voluntary adjustments between capital and labor.

While no attempt was made to deal comprehensively with the railway prob-

lem because of the recent enactment of the railroad law under which the carriers will operate under the private control, suggestions were made regarding other public utilities.

The report, which contains about 15,000 words, will be printed for distribution.

The conference was composed of seventeen members, with Secretary of Labor Wilson as chairman, and Herbert Hoover as vice-chairman.

WELDING RIGHTS TAKEN

MILWAUKEE, March 8.—The Standard Parts Co., Cleveland, has acquired the Canadian rights to the Lloyd oxy-acetylene method and machinery for manufacturing steel tubing, from the Automatic Welding Co. of Menominee, Mich. The method was patented in 1910 by Marshall B. Lloyd of Menominee. The Standard Parts Co. controls the American rights and now acquires the Canadian rights for use at its big plant in Woodstock, Ont.

TO BUILD LIGHTING UNITS

MILWAUKEE, March 8.—The Kohler Co., Kohler, Sheboygan County, Wis., one of the world's largest manufacturers of enameled sanitary ware, has engaged extensively in the production of farm lighting systems of the automatic type. The plant has been undergoing large expansion during the past year with this in view. A new engineering building, 129 x 274 ft., was completed at the end of the year, and work has been started on a large foundry, 220 x 300 ft., the capacity of which will be required mainly for the farm lighting production department.

NEW FOUNDRY PLANNED

SHEBOYGAN, WIS., March 8.—The Sheboygan (Wis.) Machine Co. will establish its own gray iron foundry and has let contracts for the first unit, 40 x 108 ft., with one cupola and an hourly capacity of 5 tons. Alfred Steffen, Jr., is president and general manager.

House Again Hears War Air Records

Rival Political Committeemen Entertain Members with Continuation of Dispute

WASHINGTON, March 8—The House of Representatives devoted five hours Saturday to the debate of aircraft expenditures during the war, with the Democrats defending and the Republicans condemning the results achieved. Approval was given chiefly by Congressman Lea, while condemnation of practically the entire aviation activities of the War Department, with the exception of the design of the Liberty engine, came from Congressman Magee. The Liberty airplane engine, stated Congressman Magee, was the only noteworthy achievement of the entire program.

Both Congressmen Magee and Lea devoted practically all their time to repetition of the remarks and the statements contained in the majority and minority reports which were recently made public by the committee investigating expenditures in the War Department.

Congressman Magee asserted that the United States spent \$1,051,000,000, and had not produced one fighting plane or purely bombing plane, and sent to the front in France for operation but 213 DeHaviland-4 planes, which he asserted are awkward, dangerous machines. At the same time, he stated, Great Britain produced twenty-seven types of one-seater fighting planes, five types of two-seaters, twenty types of observation planes, ten types of day bombers and ten types of night bombers, while France produced thirty-one types of one-seater fighting planes, ten two-seaters, twenty-two observation planes, seven day bombers and four night bombers. Italy, he said, turned out thirteen types of one-seater fighting planes, one type of two-seater, eleven observation planes, forty-one bombers and seven night bombers, and Germany twelve one-seater fighting planes, three two-seaters, ten observation and six night bombers.

Assails Director Again

A considerable part of Congressman Magee's discussion was devoted to the appointment of John D. Ryan as chairman of the Aircraft Board, and to his activities in regard to the railroads in the West, which the Congressman claimed were beneficial to interests with which Ryan was connected. He denounced the operation of the spruce production by General Disque and his employment of soldiers at a daily wage.

Congressman Lea in turn told of the vast numbers of airplane engines, airplane parts and airplane materials supplied to the Allies by this country, of the number of pilots trained, the vast numbers of airplane engines produced, the large quantities of training planes and service planes manufactured, although not shipped to the front, and the establishment of training fields both in this country and abroad for American pilots.

Giant Airplane on Cairo to Cape Flight



Photo by Kadel & Herbert.

This illustration shows the giant Vickers Vimy commercial airplane which is making the adventurous journey between Cairo and Cape Town, a distance of 5206 miles. It carries 15 people and has 760 hp. It develops a speed of 100 m.p.h. Note the four-blade propellers

Semi-Trailers and Tractors Now Taxed

Treasury Decision Approved
March 3 Reverses Ruling
Made Last Year

NEW YORK, March 8.—The Trailer Manufacturers Association has issued the following bulletin concerning the treasury decision approved March 3, at Washington, reversing its rulings on excise taxes on sales under the revenue act of 1918.

"In revising its rulings on excise taxes on sales under the revenue act of 1918, the Commissioner of Internal Revenue, in treasury decisions 2989, approved March 3 and just issued, has reversed his rulings of last year as promulgated in regulations 47, with regard to tractors and trailers forming a semi-trailer combination.

"The revenue act itself specifically exempts tractors from taxation and nowhere mentions trailers or semi-trailers. The regulations issued last year say: 'The act specifically exempts tractors, even if sold in combination with a trailer,' and also says: 'Automobile trailers, regardless of the number of wheels which they may have, are not parts of or accessories for automobiles.'

"How completely the revenue office has reversed itself is seen by comparison of the foregoing with the new decision just issued, in which it is held that a tractor is a machine 'designed to draw or pull' but that 'tractors or semi-tractors which carry a portion of the load are taxable as automobile trucks'; that 'trailers are not taxable' but that 'so-called trailers or semi-trailers so designed that a portion of the load or weight thereof is carried or borne by the tractor or semi-tractor are taxable as parts of automobile trucks.'

Technical Points in Law

"Under the law, automobile trucks are taxable at 3 per cent and automobile parts at 5 per cent. However, the new decision states that 'an automobile truck or automobile wagon formed by joining together a so-called tractor or semi-tractor ***** and a so-called trailer or semi-trailer is taxable as a whole as an automobile truck,' that is at the rate of 3 per cent, but when the two are 'sold separately, the so-called tractor or semi-tractor is taxable as an automobile truck or automobile wagon (3 per cent) and the so-called trailer or semi-trailer as a part' (5 per cent).

"If the reader fails to follow the foregoing he should blame the mental genuflections of the interpreters of the law, which is almost as popular a favorite as the Volstead act, both made particularly pleasing by seemingly zealous endeavors to construe them so they will be easy to understand and cause as little inconvenience and annoyance as possible.

"How a machine can be a tractor and tax free when it draws a four-wheel trailer and an automobile truck and taxable at 3 per cent when it draws a semi-

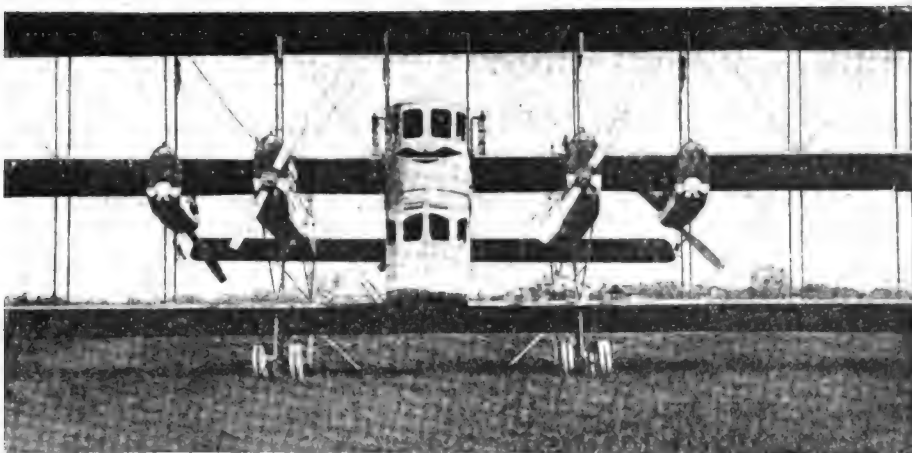


Photo by Kadel & Herbert.

Italy's New 40-Passenger Airplane

Italy's latest airplane is a double-decker. It has two fuselages and carries 40 people. This new type of machine is manufactured by the Italian Government

trailer, and how a semi-trailer can be an automobile truck when sold with a tractor and taxable at 3 per cent and an automobile part when sold separately and taxable at 5 per cent would require a Solomon to explain.

"Trailer manufacturers, relying on the regulations issued last year, have collected and paid no taxes on trailers or semi-trailers. Had they done so they would have been liable to a fine of \$1,000 or imprisonment for one year, or both. Whether or not it is the intention of the Treasury Department to make the decisions of March, 1920, retroactive is not known. To do so would impose unjust hardship on the manufacturers, who cannot now collect the tax from last year's purchasers."

CHASE ACQUIRES BEEMAN

TORONTO, March 8—An important transaction in the tractor world was concluded at Toronto, Ont., this week, by which the Chase Tractors Corp. became the Canadian distributor for the Beeman tractor, manufactured by the Beeman Tractor Co. of Minneapolis. The Beeman is a one-horse tractor, designed for small farms, truck gardens, orchards, suburban homes, plantations, etc., and will be marketed by the Chase people as an auxiliary line to their Chase 9-18 tractor.

While the present arrangement is only a distributing one, the Chase Tractor Corp. will in all probability eventually manufacture the Beeman tractor at their Toronto plant. Negotiations to that end are under way.

LATEX INSTALLS CRANES

FOND DU LAC, March 8—The Latex Tire & Rubber Co. is installing at its new plant at Fond du Lac labor saving devices for the rapid handling of tires designed especially for the company by Grant Lambright, general superintendent. A system of cranes and tables is said to give one-third more speed in handling tires.

Tire Prices Back to Former Scale

Efforts by Manufacturers to
Sustain Higher Costs by
Production Fail

NEW YORK, March 8—A general rise in tires prices in which many leading manufacturers joined went into effect to-day. As a result of the increase tire prices are back to about the same point at which they stood before the general cut of May, 1919.

Pneumatics led with increases of 15 to 25 per cent. Solids showed increases of about 10 per cent, and slight advances were made on tubes.

Rumors of the impending advance have been current for several weeks, in fact, so far back as last October the trade was prepared for the rise, but it did not materialize. This was chiefly due to the fact that efforts have been made by many of the larger companies to maintain the present prices by increased production and intensive sales effort.

The rapidly rising cost prices, contributed to largely by the upward trend of cotton for tire fabrics, are now declared to have made an increase imperative. Although there has been no appreciable increase in the cost of crude rubber, tire fabrics have been rising steadily, the cost of cord fabrics now being quoted at a figure 150 per cent in advance of cost a year ago.

This upward trend in cotton began a few weeks after the tire prices were decreased in the spring of 1919, and it is now declared that the decrease would not have been made at that time if the conditions in the cotton market had been anticipated. The failure of the Sea Island cotton crop aggravated the situation, and several additional production cost increases, including the upward trend of wages, were contributory.

Tractor Convention Planned for South

Representatives of Manufacturers
to Be Called in Special
Development Session

ATLANTA, March 5—Executive officers who direct the policies of the big implement and tractor manufacturing companies of the country are to be invited to a national meeting in Atlanta some time this spring or early summer, if the present tentative plans of the newly organized Atlanta Tractor and Implement Club materialize. This club was formed a short time ago and included in its membership are about thirty of the leading implement dealers and manufacturers' branch house representatives in Atlanta.

This meeting is to be held for the purpose of proving to the implement manufacturers that an enormous demand exists in the South for modern farm machinery of all kinds, principally tractors. The depredations of the boll weevil in the cotton fields has necessitated crop diversification with the result that the South has forged to the front in the agricultural world, now producing grain products, peanuts, velvet beans, sweet potatoes, etc., in great quantities. These crops have proven so beneficial from a financial standpoint that diversification will continue, and the result is that the big demand for modern farm machinery exists.

The meeting to be arranged here will be the forerunner, it is planned, of a tractor and implement show also to be held in Atlanta, that will be one of the biggest and most important in the country. It will be discussed at this meeting and definite plans for holding it later on probably arranged.

J. W. Rawlings, manager for B. F. Avery & Sons, president of the Atlanta Tractor and Implement Club, stated that while the plans are still tentative he believed the projects would be carried out successfully this spring and summer.

Canary Islands Offer Market for Trucks

WASHINGTON, March 5—An excellent market for motor trucks exists in the Canary Islands, where thousands of tons of fruit and vegetables are hauled yearly by mule teams from plantations to ports. This work could be economically performed by motor trucks, states Consul G. K. Stiles, in a report to the Bureau of Foreign and Domestic Commerce.

There are 875 motor vehicles registered in the islands, 400 in Tenerife and 432 in Grand Canary. Only six of these are motor trucks. There are thirty motorcycles in operation. Lacking steam railway transportation completely, the inhabitants of the island have taken promptly to the use of automobiles for passenger and freight service. These

can be increased by judicious enterprise, and the motor truck business can be greatly improved.

The managers of the big fruit combines are now contemplating the replacement of mule teams by trucks. They are eager to experiment and if an American firm will place one or two trucks with bodies especially built to suit the local needs in operation, a successful demonstration will result, states the consul, in a steady increase in sales until the mule team system disappears.

There are excellent highways throughout the islands, and but few localities where bad roads or excessive grades exist.

Trade Review Gives South American Data

NEW YORK, March 6—A trade review of South America, just compiled by the Guaranty Trust Co., reveals the formation of new steamship lines, the institution of new cable facilities and other industrial features relating to that country of direct interest to the automotive exporter of the United States. The most important related to the contemplated plans for a bi-weekly service with five steamers to the East Coast of South America, from New York, to touch at Rio de Janeiro, Santos, Montevideo, and Buenos Aires. At the same time, announcement was made that W. R. Grace & Co. would institute a fortnightly service from New York to the West Coast. The line will pass through the Canal and reach Valparaiso in 18 days, stopping at Callao, Arica, Iquique and Antofagasta.

New cable lines connecting Rio de Janeiro and Santos with the existing All-American cable system at Montevideo and Buenos Aires were said to be expected in operation next month. Prompt dispatch of international telegrams was being arranged.

American car markets in both Colombia and Panama were said to be enlarging because of a good roads campaign in the former country and the tourist season in Panama. Road-making outfits, including medium sized tractors, are needed in Colombia, according to the review.

IMPORTS 10,000 TRACTORS

OTTAWA, ONT., March 5—More than 10,000 tractors were imported into Canada during 1919, according to figures furnished by the Department of Trade and Commerce. The passenger cars imported totaled 9,367 and trucks 21,113. The cars were stated to cost \$9,304,235, and the trucks \$3,437,464.

The exact number of tractors admitted through the customs is 10,092, valued at \$10,647,557. It is interesting to note that only 317 were valued at more than \$1,400.

FIRE DESTROYS DIE PLANT

MILWAUKEE, March 8.—The Milwaukee Die Casting Co., 297 Fourth Street, Milwaukee, sustained a heavy loss by fire, covered by insurance of \$101,000. A plant will be provided in temporary quarters to fill orders.

British Consider Piece Work Plan

Employers and Trades Arrange
Conference on Wages—Agree
to 47-Hour Week

LONDON, Feb. 13.—(Special Correspondence)—The 47-hour week has been agreed to as a standard between the engineers' unions and the employers federation, but the question of the two-shift day or three-shift system is to be discussed. It is agreed also that semi-skilled piece-work prices are to be advanced. Payment by results is to be discussed at a special conference.

It was said the engineers' unions had decided by vote against the system of payment by results. The conference referred to is to be largely concerned with that decision, as the present agreement between the employers and the union men is about ending. The general opinion of organized labor is directly opposed to—because it is suspicious of—piece work in any form.

Employers are largely to blame for this outlook, partly because as a body they introduced it in haphazard fashion, and some of them clearly showed that they begrudged the men their earnings on the increased output, and largely, probably most of all, because of the comparative guess-work shown in the fixing of the prices.

England well remembers the introduction of the piece system, and the outcry caused by juggling with the rates. The present *impasse* is a legacy of that time, now over thirty years since, and with the large growth of socialistic ideals and outlook, it may be doubted if the British skilled workers can now be converted to accept the system.

OIL RIGHTS GRANTED

WASHINGTON, March 5—The Mexican Government is to permit certain petroleum companies to drill new wells, according to information received by the Bureau of Foreign and Domestic Commerce. La Transcontinental and the Union Oil Co. have been granted permission to drill three wells, while La Continental, the Mexican Sinclair, and the English Oil Co. are to drill one each. At the same time petroleum agents in Tampico have been authorized to grant twenty-two permits. As a result of these concessions it is evident that production will be greatly increased; in fact, two new wells are already producing.

MOZAMBIQUE CHANGES DUTY

WASHINGTON, March 5—The import duty on automobiles and accessories into Mozambique have been changed by a Government decree.

Automobiles range from 5 per cent to 10 per cent ad valorem.

Parts and accessories are at 5 per cent ad valorem.

Gasoline, from 3 per cent to 5 per cent ad valorem.

Lycoming Contracts for New Foundry

Will Have Capacity of 1200 Sets
of Motor Castings
a Day

WILLIAMSPORT, PA., March 5—Contracts have just been let for the erection of a large foundry for the Lycoming Foundry and Machine Co. It will be one of the largest plants in the country operating exclusively on motor castings.

About 250 tons of iron will be melted daily, permitting a production of 1000 to 1200 complete sets of castings per day. A power plant will be erected with reserve capacity for extensions of the plant. Unique features include the core room complete in a separate building connected with the foundry proper, the intervening space to be used for cooling cores after baking, eliminating the smoke.

Continuous pouring will be used on cylinders and cylinder heads and conveyors of sufficient length will be installed to permit adequate cooling of iron before shaking castings from sand to eliminate "bleeding." On completion of the new plant, the present foundry will be dismantled and converted into a machine shop.

The Lycoming company has entered into a number of large contracts with car makers recently, notable among these with the Willys interests for castings for the new 4 to be made at Elizabeth.

MOTOR OFFICIALS BACK LINE

DETROIT, March 5—The Detroit Motorbus Co. organization has been completed with the election of the following officers: R. W. Meade, president and general manager; S. D. Waldson, vice-president; Sherman D. Callender, secretary. The board of directors included H. W. Alden, of the Timken-Detroit Axle Co.; W. F. Evans, president of Standard Screw Products Co.; Major Edwin Denby, and other prominent men.

It is the plan of the company to start service on one complete bus line as soon as buses can be obtained and to extend the service as rapidly as the situation demands. Confidence in the venture is evinced by the purchase of stock at par by all of the officials and directors. No promotion stock has been issued and none will be sold at less than par.

FORMOSA POOR MARKET

WASHINGTON, March 6—There are twenty-five automobiles and three motorcycles in the city of Taihoku and two automobiles and two motor trucks in Taiwan, Formosa, according to a report from Consul Kirjassoff. Five of the cars in Taihoku are used on a bus service, being capable of seating sixteen persons each. All but one motor car, which is an Italian car used by the Government, and one English motorcycle are of American manufacture. Most of the automobiles are public conveyances.

The roads in Taihoku and its immediate vicinity are good and without steep grades. There is a road to Tansui (about 16 miles) and another to Keelung (about 18 miles), but these are narrow and with many difficult turns. For these roads cars of good "pulling" power on second and first speeds are necessary.

Although the number of automobiles is gradually increasing, there is small chance of an extensive market in the near future. Passenger cars must compete with cheap railway service, run on a fairly frequent schedule to outside points, and with the light railways which use coolie power. The great majority of the population is too poor to afford cars. Because of comparatively cheap coolie labor and the fact that Taiwan is hardly at all developed industrially, there is no great market for motor trucks here, but the sugar companies may eventually find it to their interest to use them.

Both National Shows Win Success in Kind

NEW YORK, March 5—New York and Chicago divided the honors this year in the two big shows held under the auspices of the National Automobile Chamber of Commerce.

Reports of the show committee, submitted at the N. A. C. C. meeting here yesterday, show that New York's paid attendance was considerably larger than Chicago's, but the business reported by dealers was greater in Chicago than in New York. Chicago's attendance was somewhat affected by the "flu" epidemic.

The returns to the exhibitors were the best of any of the shows under N. A. C. C. management. They were as follows:

New York Passenger Car Show: 130 per cent; New York Motor Truck Show: 88 per cent; Chicago Passenger Car Show: 72 per cent; Chicago Motor Truck Show: 75 per cent.

JACQUET BUYS FACTORY

BELDING, MICH., March 5—Jacquet Motors Corp., organized recently, expects to be in production about the middle of April. The company has purchased an ammunition factory and property adjoining, for which it paid \$50,000 in cash. Machinery for automobiles is rapidly being installed, and the company is assembling and organizing its working force.

They will build a four-cylinder car with a 124-inch wheel base, and reports from the factory are to the effect that the experimental car developed 92 miles on a circular track. All of the men associated in the company are known in the industry and have been in the game in some instances for more than twenty years.

BESSEMER TRUCK TO BUILD

PHILADELPHIA, March 6—Additions to the factory property at Decatur street and the Pennsylvania Railroad tracks will be made by the Bessemer Motor Truck Co. at a cost of \$48,000.

Trade with England Gains in January

Imports and Exports of Cars,
Parts and Tires Show
Increase

LONDON, Feb. 17—(*Special Correspondence*)—The January export of British vehicles was 204, valued at pre-war rates of exchange at \$655,000, and the number of chassis exported was 105, valued at \$405,000. The value of exported motor car and truck parts (not tires) was \$637,712, and of tires, \$2,379,730.

Imported vehicles in January reached 2086, valued at \$3,222,968, and chassis, 911, valued at \$1,798,810. The value of imported parts (not tires) was \$2,638,420, and of tires, \$1,757,990. The motorcycle export value for January was \$420,660; parts, \$90,385; and tires, \$897,730. The import value was: Motorcycles, \$170,630; parts, \$20,695, and tires, \$1,757,990.

It will be seen that while there has been a notable increase in the total volume of trade during January, the imports—mainly from the United States—have increased relatively much more than the export of British vehicles and chassis.

For instance, while Great Britain exported 204 vehicles as compared with 52 in January, 1919, she imported 2086 vehicles as compared with 17 in January, 1919. Regarding the tire values, both imports and exports, it should be noted that they denote totals inclusive of cars, motorcycles and cycles, the distinctive classification having been abandoned since the beginning of this year.

Nova Scotia to Spend \$58,000,000 on Highways

MONTREAL, March 5—The Nova Scotia Highway Board has selected 4000 miles of the most important highways of the province which they propose to rebuild of the very best road materials which are available and for which the province has the ability to pay. In addition to the rebuilding of these roads a large mileage of secondary roads is to be improved by the removal of rocks and ledges, and by adequate draining systems. The program of road construction and improvement calls for years of time and many millions of dollars. The announcement is made that \$58,000,000 will be spent on the undertaking during the next five years.

STEWART MOTORS FORMED

BOWLING GREEN, OHIO, March 8—The Stewart Motor Car Co. has been chartered with a capital of \$500,000 to manufacture and sell a line of passenger cars. The company will take over the plant of a former motor truck concern. The incorporators are Y. Frank Stewart, Charles H. Gifford, Irene Baringer, Willis Barnes and C. S. Hatfield.

Part Time Students to Meet Labor Need

New Texas Truck Company Will Finance Education to Get Assistance

AUSTIN, TEX., March 8—D. J. Woodward of San Antonio and associates have purchased the former radio aviation school and tract of 60 acres at Austin and are organizing a company to convert the establishment into one of the largest motor truck body manufacturing plants in the South. The property is known as Penn Field. The buildings now located upon the land were erected by the University of Texas for the War Department at a cost of \$187,000. They are of brick construction and are equipped with water, electric light and power and modern sewerage. A spur railroad track gives them a transportation outlet.

Woodward says that the company which is now being formed will have a capital stock of \$500,000. No stock will be sold to outsiders. It is the purpose of the new company to solve the labor problem by utilizing to a great extent the spare time of the students at the University of Texas. Realizing that there are hundreds of students compelled to work their way through college, the new company plans to give all who desire to take advantage of the offer board, lodging and laundry for a certain part of their time each day. One of the five buildings will be set aside for housing those who take up spare time work at the plant, and the company plans to furnish transportation to and from the university.

"This is in no way a philanthropic plan," said Woodward. "It is simply a new feature of modern industry and we plan to utilize the tremendous manpower of the student body that would otherwise go to waste. At the same time this plan gives the young men of the state a chance to earn their way through college and learn a useful trade while acquiring university knowledge."

TO MAKE VACUUM CARBURETER

HOLYOKE, MASS., March 6—For the manufacture of a vacuum carbureter for automobiles the newly incorporated Burr Appliance Co., with capital stock of \$250,000, is to build a modern plant here immediately. Charles F. Munder of Springfield is president, Charles D. Heywood, treasurer, and with Russell L. Davenport of this city they compose the board of directors. The capital stock is divided into 15,000 shares of common stock at \$10 a share and 1000 shares of preferred stock at \$100 a share.

NEW DROP FORGE COMPANY

MILWAUKEE, March 8—The Interstate Drop Forge Co. of Milwaukee, a new \$250,000 corporation organized to manufacture commercial drop forgings for the automotive and machinery industries, has broken ground for a new forge and machine shop group costing \$200,000. Officers of the company have been elected

as follows: President, William C. Frye; vice-president and general manager, Major Sherman M. McFedries; secretary-treasurer, C. R. Messinger; directors, Edgar L. Wood, B. Fleeger and J. M. Olmstead, Chicago. Frye is president of Chain Belt Co. and secretary of Sivyver Steel Casting Co., Milwaukee. Major McFedries formerly was sales-manager, Cutlet-Hammer Mfg. Co., later taking charge of production for the Ordnance Corps in the Wisconsin district. Messinger is vice-president and general manager, Chain Belt Co. and Sivyver Steel Casting Co. Olmstead is a member of the Electric Steel Co., Chicago.

930 Sales at Round-Up

LA CROSSE, WIS., March 8.—Five hundred La Crosse tractors and 430 plows were purchased at the annual 3-day round-up of western distributors and dealers of the La Crosse Tractor Co., held at the factory in La Crosse, Wis. Of the orders placed, 156 tractors and 113 plows were for immediate delivery. All except nine of the visiting distributors and dealers signed contracts and placed orders for 1920.

Stutz to Issue 20,000 Shares of New Stock

INDIANAPOLIS, March 9—Authority for an increase in the capital stock of the Stutz Motor Car Co. of America, Inc., from 100,000 to 120,000 shares, will be sought at a meeting of stockholders set for March 26. A stock dividend of one-fifth of a share has been declared and will be payable April 15 to stock of record April 5, if approved at the stockholders' meeting.

Net profits for the year ended Dec. 31, 1919, were \$997,148, equivalent to \$9.97 a share on the 100,000 shares of outstanding stock of no par value. This compares with earnings of \$594,047 or \$7.92 a share on the 75,000 outstanding shares in 1918.

FORT WAYNE PLANT BUSY

FORT WAYNE, IND., March 8—Another entry into the automobile tube manufacturing business is the Fort Wayne Tire & Rubber Manufacturing Co. of Fort Wayne. This concern is a purely Fort Wayne enterprise and has erected and is now occupying a modern factory building on Jacobs Avenue. It has just begun operations, and in recent advertisements has this to say about itself: "We are now manufacturing Wayne Supertested Red and Gray Auto Tubes in our new plant at the rate of 200 a day, consequently it is now possible to supply some of the demand that exists and will be created for these tubes."

FORMS REBUILDING COMPANY

COLUMBUS, OHIO, March 6—The Case Automotive Rebuilding Co. has been chartered with a capital of \$102,500 by A. A. Case, E. S. Shank, T. McD. Hills, T. E. Franch and C. E. Steeb.

Southern Highways to Cost \$25,000,000

Federal Aid in Sixteen Southern States Is Apportioned—Texas Leads in Mileage

ATLANTA, March 8—Good road projects in the sixteen Southern states already in progress or ready for construction to begin in the near future, will cost almost \$25,000,000, according to official estimates of the Bureau of Roads of the Department of Agriculture, recently announced. It is estimated that these projects call for the construction or improvement of 2671 miles of roads in the South.

These figures include only those projects ready for actual work to begin, and there are several other road improvement projects that have been agreed upon between the State and Federal governments that are not included in these totals. This will serve to swell the total cost to a much larger figure and also total mileage.

Georgia leads in total mileage in the Southeast, with 307 miles to cost \$1,725,798, and ranks second among all the states of the South. Texas leads the South because of its immense size, with a total mileage of 607, calling for an expenditure of \$3,508,278. North Carolina is third, total mileage 255, estimated cost \$1,716,100; Louisiana is fourth, total mileage 248, estimated cost \$2,037,244; Alabama is fifth, total mileage 240, estimated cost \$1,053,587.

Hercules Expands; to Make Own Castings

CANTON, OHIO, March 8—The capital stock of the Hercules Motor Mfg. Co. has been raised from \$800,000 to \$1,500,000, all common stock, to permit the carrying out of plans for greatly increased production. The following officers were elected: J. G. Obermier, president; Gordon M. Mather, vice-president; Charles Balough, secretary, treasurer and general manager; H. H. Timken, chairman of board; Rathburn Fuller, R. W. Gallagher and Austin Lynch, members of the board of directors.

A separate company, known as the Motor Castings Co., has recently been formed to furnish castings for Hercules engines. The demand for the heavy duty type engines which the Hercules company builds has been heavy. With completion of the present plans the increased production will enable the company to catch up with the demand.

FULLER FOUNDRY IN SWING

KALAMAZOO, MICH., March 6—Fuller & Sons Mfg. Co., forced by shortage of gray iron castings to equip their own foundry, poured the first run of iron Feb. 27, three days ahead of schedule, and the foundry now is in full operation. The new addition is equipped with the latest type of foundry machinery, and is in charge of a practical foundry man of long experience. All modern devices for an efficient foundry have been installed.

Packard Accepts Canadian Exchange

Notifies Agents Funds Will Not Only Be Taken But Reinvested There

TORONTO, March 4.—The Packard Motor Car Co. has notified its Canadian distributors, the Ontario Motor Car Co., Ltd., that not only will they accept Canadian funds at par on the purchase of Packard cars, but also will invest such funds in Canada.

Stewart-Warner Speedometer Corporation has notified its Canadian distributor, Donald Johnston of Toronto, who has branches in Montreal and Winnipeg, that they will absorb 50 per cent of the exchange on specialties sold in Canada.

The Canadian distributors of the Liberty Motor Car Co., the Premier Motor Sales of Toronto, announce that the Liberty company has been accepting the Canadian dollar at 100 cents on the American dollar right along and investing Canadian funds in Canadian securities.

Belmont Motors Seeks More Working Capital

HARRISBURG, Pa., March 6.—At a meeting of the stockholders of the Belmont Motors Corp. held in the executive offices in Harrisburg, Pa., action was taken directing the corporation officials to enter into negotiations with the Fidelity Investments Co. looking to the sale, to that company, of all that now remains unsold of the authorized \$1,000,000 of preferred stock of the corporation. Wm. G. Hamilton, of the Fidelity Investments Co., says that in the event of successful negotiations with the corporation, there will be put into effect at once a plan to have the plant of the Belmont corporation at Lewistown, Pa., turn out trucks in large numbers within a short time. The plant there now is operating on a limited capacity basis and it is intended, should the deal go through, to produce twenty trucks every day, giving employment to 400 hands, many of whom would be skilled workmen.

CANTON RIM TO ENLARGE

CANTON, OHIO, March 6.—To carry out a policy of enlarging the factory and to provide more facilities, steps have been taken by the Canton Rim Co. to increase its authorized capital from \$100,000 to \$500,000.

GOODRICH EARNS \$17,304,813

AKRON, OHIO, Mar. 6.—B. F. Goodrich Co., in its annual report as of Dec. 31, shows net profit after charges, but before Federal taxes, of \$17,304,813, equivalent after deduction of preferred dividends to \$25 a share on the \$60,000,000 common stock of \$100 par value, compared with \$23.08 the preceding year.

Stockholders will be given opportunity March 10 to vote on the issuance of

\$30,000,000, 7 per cent convertible gold notes due in 5 years. In addition, the common stock is to be increased from 600,000 shares of \$100 par value to 1,500,000 shares of no par value. Of this amount 600,000 shares will be exchanged share for share for the present stock; 125,000 shares will be set aside for employees; 375,000 shares will be reserved for issue, and the 400,000 will be available for future requirements.

Common stockholders will have the right to purchase at the rate of \$100 of notes for each two shares of common stock held, at the price of \$99 for each \$100 note, or they can purchase new common stock at the rate of one and a quarter shares for each two shares of old stock at the rate of \$80 a share.

Financial Notes

The Kelly-Springfield Tire Co. reports gross profits on sales of \$7,034,284 for the year ended Dec. 31, 1919, as against \$7,187,834 in 1918, and a surplus active dividend of \$1,665,380 as against \$3,374,116 the previous year. The balance sheet of Dec. 31 shows cash in bank and on hand of \$1,679,946. Accounts receivable, \$1,970,441; notes receivable, \$63,586; inventory, \$7,073,642; accounts payable, \$351,652, and a total asset and liability of \$23,796,029.

The Pennsylvania Rubber Co. will pay the regular quarterly dividend of 1½ per cent on preferred stock and 1½ per cent on common stock March 31 to stockholders of record March 15.

The Pierce Arrow Motor Car Co. has declared the customary dividend of 2 per cent on preferred stock, payable April 1 to stockholders of record March 15.

Mason Tire Co. and the Mason Cotton Fabrics Co. have submitted a consolidation plan, which will be voted on by stockholders March 31. The plan contemplates a capital increase from \$5,000,000 to \$10,000,000, all of which will be 7 per cent cumulative preferred stock. Stockholders have been advised of the plan and the ratio for the exchange of stock.

The William Small Co., Indianapolis, has increased its capital stock from \$1,000,000 to \$3,000,000 and plans a production of 200 cars daily.

Oak Tire & Rubber Co. report earnings in 1919 at nearly 11 per cent on the \$350,965 capital stock outstanding.

Peerless Truck & Motor Corp. has declared an extra dividend of ½ per cent on the stock along with the regular quarterly dividend of 1½ per cent, both payable April 1, to stock of record March 1.

The Winton Co., in a balance sheet as of Jan. 13, shows a profit and loan surplus of \$2,266,605, as compared with \$2,094,986 in 1919.

Standard Parts Gets Loan of \$6,000,000

Cleveland and New York Bank- ing Houses Advance New Working Capital

CLEVELAND, March 6.—Additional capital requirements of the Standard Parts Co. are provided in a loan of \$6,000,000, the arrangement for which has just been announced in Cleveland. Five of the foremost Cleveland banks and the Chase National of New York, together with Otis & Co. and Borton & Borton, investment security houses of Cleveland, are behind the big parts concern in this financing.

At the annual meeting of the company, officers were elected as follows: President, J. O. Eaton; vice-presidents, E. J. Hess, John Younger, Dan C. Swander; secretary, P. A. Connolly; assistant secretary, R. C. Hyatt; treasurer, T. E. Borton. The directorate also includes C. I. Ochs, Maynard H. Murch, F. R. White, H. P. McIntosh, Sr., W. H. Prescott, W. E. Bock, C. S. Eaton, T. H. Jones.

Willys Corporation Has 1919 Profits of \$5,364,683

NEW YORK, March 4.—Total profits of \$5,364,683 before dividends and taxes are shown in the report of the Willys Corp. for the year ended Dec. 31, 1919, the figures covering operations of the constituent companies for the first six months to July 1, the date of the original balance sheet, and for six months after.

Balance after dividends, taxes, etc., was \$3,250,800. Total assets after deducting all liabilities and reserves, including taxes, were \$51,185,618.

The corporation has orders and contracts booked which will strain the capacities of its established plants, according to the report to the stockholders of J. R. Harbeck, vice-president.

LANSING TRIPLES CAPITAL

LANSING, MICH., Mar. 6.—The Michigan Securities Commission has approved a new stock issue of the Lansing Stamping and Tool Co. from \$100,000 to \$300,000. Of this amount \$50,000 worth of the stock is 7 per cent preferred, the remainder common. The company has on its books a half million dollars worth of business contracted for since Jan. 1, and negotiations are in progress on a contract that will bring the 1920 business to \$1,000,000.

LANGSTADT ADDS TO CAPITAL

APPLETON, WIS., March 8.—The Langstadt-Meyer Co. of Appleton, Wis., a large electrical contracting concern which in the past two years has developed a successful farm lighting plant and self-contained generating plants for the army, has increased its capital stock from \$50,000 to \$400,000.

Holmes Reorganizes and Plans Expansion

CANTON, OHIO, March 6—To meet the growing demand for the air-cooled automobile, the Holmes Automobile Co. has reorganized and selected Frank H. Golding, four years vice-president and general manager of the Ohio Power Co., as general manager. Expansion of the local concern will commence April 1, when Golding assumes charge.

The directorate re-elected follows: Arthur Holmes, C. H. Rockwell, George W. Belden, W. C. Laiblin, and Clarence G. Herbruck, all of Canton; Fred H. Snyder, Massillon, and R. S. Suydam, of Pittsburgh. Officers elected at the meeting were: Arthur Holmes, president and treasurer; C. H. Rockwell, vice-president; F. H. Golding, general manager, and George W. Belden, secretary.

Reports for the year show the company has already changed from 100 per cent war basis to a 100 per cent automobile business, notwithstanding the recent coal and steel strikes and freight embargo. The books show unfilled orders for approximately \$1,000,000 worth of cars.

TAKE OVER TRACTOR COMPANY

CHARLES CITY, IOWA, March 5—The plant and business formerly conducted by the American Engine and Tractor Co. in this city have been taken over by a new concern to be known as the American Tractor and Foundry Co., a South Dakota corporation with a capital stock of \$500,000. Some of the members of the old concern are also active in the new corporation, so that what has really taken place is a reorganization by which new capital has been made available. The plant occupied consists of two spacious brick buildings alongside the Illinois Central tracks about half a mile from the town limits.

A farm tractor was developed by the old company and about half a dozen machines had been built when the outbreak of the war made a continuation of the work impossible. The new concern plans to specialize on a farm lighting plant of 1.5 kw. output comprising a Westinghouse generator and an engine of the company's own manufacture. A line of stationary farm engines will also be built and it is the intention later to take up the manufacture of farm tractors, using the model already developed. Application has been made for the registration of the trade name "Americo." A yearly production of 5000 lighting sets is contemplated and deliveries will begin in April. W. L. Joyce is president and H. L. Laird secretary of the new corporation.

UNION STEEL BUYS PARKER

ALBION, MICH., March 5—The Union Steel Products Co. has purchased the plant and business of the Parker Collapsible Rim Corp. of Chicago, and will move the machinery to this city at once. The new plant will furnish employment for 500 men.

Current News of Factories

*Notes of New Plants—
Old Ones Enlarged*

Du Pont Completes Organization Plans

WILMINGTON, DEL., March 5—Du Pont Motors, Inc., has been formed in this city to succeed the Du Pont Motor Mfg. Corp., and has announced the acquisition of the Delaware Marine Motors Co., of Wilmington. The capitalization of the company has been increased to \$1,500,000, 7 per cent preferred, and 30,000 shares of common at no par value.

The company will manufacture the Du Pont automobile and also the Du Pont marine engine. In connection with the acquiring of the assets of the Delaware Marine Motors Co., it is said this plant will probably be discontinued with the location of the Du Pont company on a site near Philadelphia.

Officers of the Du Pont company are: E. P. Du Pont, president; A. M. Maris, vice-president and general manager; Parke Ross, treasurer, and C. B. Bishop, secretary.

ENTERS AUTOMOTIVE FIELD

CHICAGO, March 5—The Brassco Manufacturing Co., which has been engaged here for some years in making metal store fronts, will manufacture a line of drawn or rolled mouldings and shapes for the automotive industry. Included in the line will be windshield tubing, bumpers, drip drains, angles, channels, and similar metal items. The company stated that it was prepared to undertake such work in any metal.

ORLEANS TRUCK GETS SITE

NEW ORLEANS, March 5—The New Orleans Truck Manufacturing Co., of which E. C. Patton is president, has purchased a "daylight" factory building, at Tchoupitoulas and Belmont Streets, for \$53,000. The building is 76x140 ft. and is considered the largest truscon steel factory building in the South. Machinery is being installed and 300 trucks contracted for on the basis of the first truck, now in operation, built by Mr. Patton in a private shop.

TO MAKE PISTON RINGS

ROCKFORD, ILL., March 4—The Universal Piston Ring Co., Rockford, Ill., has been incorporated with capital stock of \$100,000 and will manufacture its product at 1026 Charles Street until permanent quarters are secured. Officers have been elected as follows: President, William Stenlund; vice-president, G. W. Hamlin; secretary, Richard F. Clapp; treasurer, W. P. Burdick; manager, W. G. Burdick.

Bacon Motors to Build Two Additional Units

PHILADELPHIA, March 5—Bacon Motors Corp. is planning the erection of two additional automobile factory buildings and a large office building on its 21-acre tract in New Castle, Pa. One factory building, recently completed, has begun manufacturing operations.

The additional structures will be a large shop for the making of automobile motors; a three-story building, 600 x 50 ft. for a body-building, upholstering and painting plant, and the office building, which will provide facilities for the officers of the corporation and the superintendents of the various departments. There will be a cafeteria for employees.

It is intended by the corporation to be on a small producing basis by May of the present year and by October, it is planned to have a daily output of twenty-five cars, the product to be: Five-passenger touring cars, two-passenger sports model roadsters, four passenger coupes and five-passenger sedans. All bodies will be installed on chasses of the same model.

The program calls for a duplicating system within two years, to make the annual output of the factory 15,000 cars. The company will be capitalized at \$2,000,000, according to announcement.

SUPERIOR TRUCK TO BUILD

ATLANTA, March 5—A modern plant for the manufacture of automobile trucks will be constructed at Wells Street and the Southern Railway in Atlanta by the Superior Motor Truck Co., manufacturers of Superior trucks. Actual construction work will start in the near future, it was announced, much of the building material being already on hand.

The company's present plant on Stewart avenue was sold a few days ago for \$65,000 to the K. L. Jones Machinery Co. by E. M. and E. G. Willingham, owners of the Superior Truck Co. The present plant provides about 25,000 sq. ft. of floor space, while the new plant, on a site providing 65,000 sq. ft., will serve to almost triple the capacity of the present plant.

MADISON LOCATES OFFICES

NEW YORK, March 5—The Madison Tire & Rubber Co., Inc., will move from its present quarters, 254 West Fifty-seventh Street, to its own building, 20 West Sixtieth Street, about May 1. This company has also purchased in Boston a three-story building on Boylston Street, which is to be used as the New England headquarters. Arrangements have been made to open branch offices in Chicago and Philadelphia. In addition to this there will be warehouses in each of these localities.

GRIFFIN PLANS IOWA PLANT

COUNCIL BLUFFS, IOWA, March 5—The Griffin Wheel Co. is planning the erection of a \$2,000,000 factory in this city.

May Form Pittsburgh Division of S. A. E.

PHILADELPHIA, March 5—About fifty members of the Pennsylvania Section of the Society of Automotive Engineers held their regular monthly meeting at Pittsburgh of Feb. 28; something like half of the total number making the trip from Philadelphia and other eastern points. During the morning a trip of inspection to the Braeburn Steel Co. plant at Braeburn, Pa., was made and a buffet lunch was served by the company at noon.

After the return to Pittsburgh, a professional session was held in the afternoon at the Pittsburgh Chamber of Commerce. J. M. Schoonmaker of Pittsburgh, who was formerly connected with the Dayton-Wright Airplane Co., gave an instructive talk, illustrated with moving pictures, on airplane quantity production at Dayton during the war. A banquet at the William Penn Hotel, and a theater party later in the evening, were other features of this meeting.

In view of the large number of automotive engineers now located in the Pittsburgh district, the formation of a Pittsburgh or Western Pennsylvania Division of the Pennsylvania Section of the S. A. E. is now being considered.

LAMBERT TIRE MAKES PLANS

BARBERTON, OHIO, March 4—Changes in the organization of the Lambert Tire & Rubber Co. have been effected simultaneously with improvements looking to doubled production in the plant. H. H. Lambert has been re-elected president; Judge Arthur Langwith, vice-president and chairman of the board of directors; N. W. Coyle, vice-president and director, and Porter E. Ramsey, a director and general superintendent of the factory. J. H. Hausan has been re-elected secretary-treasurer and also temporarily replaces G. K. Fargo as general manager.

OPEN ENGINEERING OFFICES

NEW YORK, March 6—Charles M. Manly and C. B. Veal have established offices at 250 West Fifty-fourth Street, as industrial engineers, specializing in the co-ordination of engineering and manufacturing requirements in the design production and operation of automotive power plants and vehicles.

PLOW DESIGNER DIES

DALLAS, TEX., March 6—William Sobey, former vice-president of the J. I. Case Plow Works Co., who died here recently, was for fifty years connected with the farm implement business. In the course of his career he designed thirty improvements which are in use to-day.

CYCLOMOBILE PRODUCTION

TOLEDO, March 5—Charles F. Hamel, president of the Cyclomobile Mfg. Co., said the company would begin production April 1. Financing of the company by public subscription is about completed, he said.

Men of the Industry Changes in Personnel and Position

I. D. Cross, who has been representing the Northwestern Chemical Co., of Marietta, Ohio, manufacturers of Norwesco "chemically correct utilities" in the Western states, has been made Western sales supervisor.

G. H. Ford has been appointed sales-manager of the H. C. S. Motor Car Co.

M. S. Cooper, formerly of the sales department of Willys-Overland, Inc., has been appointed salesmanager of the Keystone Motor Truck Corp. of this city. He formerly was in charge of the commercial car division of the sales department of the Overland company.

Horace A. Brown, Jr., who has been identified with the Hyatt Roller Bearing Co., for the past nineteen years, has been promoted to managership of motor bearing division, located at Detroit.

F. W. Ramey has been appointed advertising manager of the Cotta Company, manufacturers of transmissions.

H. B. Dinneen has been appointed trade manager of the Moline Plow Co., Moline, Ill.

R. V. Kendall has been appointed vice-president in charge of production for the Mull Wood Work Co., manufacturers of steering wheel rims. He formerly was production engineer for the Cadillac Motor Car Co.

SALES AGENT OPENS OFFICE

NEW YORK, March 9—Horace H. Eckhouse, who was formerly with the B-E Motor Engineering Co. at 50 East Forty-second Street, has entered business for himself at 1834 Broadway as a manufacturer's representative, opening up about March 1. His lines include the product of the K. E. Lamp Co., Cincinnati, Duplex Machine Co., Newark, and the Melotone Warning Signal and the Duplex Double Spring Bumper for Fords and Overlands and a new timer made by the Recto Mfg. Co., Cincinnati, and also a line of las-stik-tube patches.

MURRAY BUYS WIRE PLANT

DETROIT, March 5—J. W. Murray Mfg. Co. has purchased the plant of the General Spring & Wire Co. for \$200,000. The plant was purchased from the L. A. Young interests, which controlled the property.

The Murray company has announced an extra dividend of 5 per cent, payable to stockholders March 15. The company estimates gross sales for the fiscal year between \$5,000,000 and \$6,000,000. The Murray-Ohio Co., a subsidiary, is expected to do a gross business of approximately \$1,000,000.

Horace E. Dodge New Director of N. A. C. C.

NEW YORK, March 4—Horace E. Dodge was elected to the Board of Directors of the National Automobile Chamber of Commerce to-day to fill the vacancy caused by the death of his brother, John F. Dodge.

The members adopted resolutions of sympathy to the family, expressing also the industry's sense of loss.

John F. Dodge died in New York from an attack of pneumonia which followed a cold contracted while attending the New York show.

Jones New President of Republic Rubber

AKRON, OHIO, March 4—Guy E. Norwood, former secretary of B. F. Goodrich Co., tendered his resignation as president of the Republic Rubber Co. of Youngstown. He will remain as director of the company.

E. F. Jones, formerly of the Elyria Iron & Steel Co., was elected to succeed Norwood. The latter has been in charge of the Republic since June, 1917.

PACKARD GETS LIBRARIAN

NEW YORK, March 4—Dorsey W. Hyde, Jr., has resigned as librarian of the New York Municipal Reference Library to accept a position as chief of the motor truck research bureau of the Packard Motor Car Co. of Detroit. The bureau will be a new development of the company's service aiming at the collection and classification of all data pertaining to transportation problems and their solution.

NEW OFFICERS CHOSEN

BARBERTON, OHIO, March 6—New officers of the Rubber Products Co., chosen at a recent meeting of directors, are J. W. Blaser, treasurer and director of sales; W. S. Dellett, sales manager succeeding Edward S. Babcox, and H. P. Harding, eastern district manager. The company makes the Stronghold tires and tubes. A 200 per cent increase in sales is planned for 1920.

TEMPLAR REORGANIZES

CLEVELAND, March 6—The Templar Motors Co. has been incorporated with a capital of \$10,000,000 to take over the Templar plant in carrying out the reorganization scheme. The incorporators are M. F. Bramley, J. H. Orgill, W. O. Cooper, A. M. Dean and D. C. Reed.

TO SELL WINTONS ABROAD

DETROIT, March 4—Samuel A. Wallace, Ford distributor in London, England, while in Detroit this week, announced that W. E. Burlock, who is associated with Wallace in several English enterprises, would handle Winton distribution in the United Kingdom. Burlock also is negotiating for London distribution of the Columbia.

Calendar

SHOWS

Mar. 12-20—Boston, Mass. Annual Automobile Show. Mechanics' Building.

Mar. 15-20—Great Falls, Mont. Automobile Show. Montana Automobile Distributors' Association.

Mar. 20-27—Trenton, N. J. Annual Automobile Show. Armory. Trenton Automobile Dealers' Assn. John L. Brock, Manager.

Mar. 20-27—Pittsburgh. Motor Square Garden. Automotive Association, Inc. John J. Bell, Manager.

Mar. 22-27—Duluth, Minn. Automobile Show. Duluth Auto Trades Assn. W. F. Daly, Director.

Mar. 22-27—Utica, N. Y. Annual Automobile Show, Utica Motor Dealers' Association.

Mar. 22-27—Oklahoma City, Okla. Annual Automobile Show. Oklahoma City Motor Car Dealers' Assn. G. W. Woods, Manager.

April 21-28—San Francisco. National Aeronautic Exposition. Exposition Auditorium.

Oct. 6-16—New York. Electrical Show. Grand Central Palace. George F. Parker, Manager.

FOREIGN SHOWS

April or May—London, England. Commercial Vehicle Exhibition. Olympia.

April 3-May 4—Buenos Aires. Exposition of U. S. manufacturers.

May 15-June 13—Cars, Parts and Accessories. Antwerp.

June 26-July 25—Commercial vehicles, tractors, camions and engines. Antwerp.

July—London, England. International Aircraft Exhibition. Olympia. The Society of British Aircraft Constructors.

Aug. 7-Sept. 15—Motorcycles, sidecars, etc. Antwerp.

CONTESTS

August, 1920—Paris, France. Grand Prix Race. Sporting Commission Automobile Club of France.

June, 1920—Omaha, Neb. Reliability Truck Tour.

CONVENTIONS

May 9-12—Independent American Petroleum Congress, Congress Hotel, Chicago.

May 12-15, 1920—San Francisco. Seventh National Foreign Trade Convention.

S. A. E. MEETINGS

Mar. 23—Buffalo Section Meeting.

Mar. 25—Pennsylvania Section Meeting. Subject—High Speed at Great Altitudes, Com. H. C. Richardson, U. S. N.

April 7—Minneapolis Section Meeting. Subject—Tractor Weight and Drawbar Pulls.

Trade Opportunities in Foreign Markets

WASHINGTON, March 6. — The Bureau of Foreign and Domestic Commerce, Department of Commerce, has received requests for automobiles or parts agencies of business from individuals and companies in foreign countries. These are listed below. For further information address the Bureau of Foreign and Domestic Commerce and specify the Foreign Trade Opportunity Number.

A merchant firm in England desires to secure an agency for the sale of automobile lamps and horns, the horns to be preferably of the bulb type. References. 32149.

The owner of extensive forests in Manchuria desires to communicate with manufacturers of tractors. 32155.

A commercial agent in Italy desires to secure an agency for the sale of pneumatics, automobile and motorcycle accessories. Quotations should be given c.i.f. Genoa or Naples. Payment against documents. Correspondence may be in English. References. 32162.

An American firm maintaining offices in Mexico, Brazil, Argentina, Berlin and Paris desires to secure agencies for the sale of machinery, automobiles, motor trucks and tractors. References. 32185.

An American firm of manufacturers' agents, having a branch house in the Philippine Islands and being general distributors throughout the Orient, desires to secure exclusive agencies from manufacturers of carburetors and other appliances for automobiles. References. 32176.

A commercial agent in Italy desires to secure an agency for the sale of automobiles and accessories. Correspondence should be in Italian or French. References. 32179.

EISEMANN GETS CONTRACTS

NEW YORK, March 8—The Eisemann Magneto Corp. has received a contract for magnetos for the Dixie Flyer, built by the Kentucky Wagon Mfg. Co., Louisville, Ky. This company has used Eisemann ignition as standard equipment on its trucks for some time.

It has also received a contract from the Maccar Truck Co., Scranton, Pa., covering a period of 13 months.

The Eisemann corp. has opened a new sub-station at Washington, D. C.—the Auto Electric Service Co. This station is a sub-station of the Automotive Engineering Co. of Baltimore, Md., official service representative.

Recent contracts for magnetos have been signed with the following companies: Superior Motor Truck Co., Atlanta, and the Commerce Motor Truck Co., Detroit.

PISTON RING EXPANDER MADE

MADISON, WIS., March 8—Orvey Johnson of Madison, Wis., inventor and patentee of a piston ring expanding device for automotive shops and garages, is entering upon a large production which will be marketed from Madison by the Johnson Specialty Co., 616 East Washington Avenue. Large orders for the tool have been booked. For the present it will be made under contract with Madison metal-working shops. Later, Mr. Johnson will establish a factory of his own.

LOCK COMPANY ORGANIZED

EAU CLAIRE, WIS., March 8.—The Eau Claire Auto Lock & Novelty Co. has been organized at Eau Claire, Wis., with a capital stock of \$20,000 to manufacture patented locking devices for motor vehicles and a line of specialties and novelties. The incorporators are Samuel S. Swan, James Forest, Ben. A. Hanch and Frank J. Zivney.

ABRASIVE FIRM TO BUILD

WAUSAU, WIS., March 8.—The Wausau (Wis.) Abrasives Co. will build a new factory, 60 x 200 feet, to increase its output of brasures, sandpaper, etc. J. K. Sawyer is general manager.

Herschell-Spillman Plans 100,000 Output

NEW YORK, March 8—The Herschell-Spillman Motor Co. of North Tonawanda, N. Y., has started quantity production of its new Model 1100—3½ x 5 six cylinder engine and deliveries started in March with sufficient material on hand to assure the full quantity scheduled for that and several succeeding months. Contracts for material necessary to 1920 production have been placed.

The demand for the firm's Model 7000—3½ x 5 four-cylinder engine, and the new Model 11000—3½ x 5 six-cylinder engine, has necessitated the elimination of all other sizes and types. A manufacturing program requiring a minimum of 60,000 engines for delivery prior to Dec. 31, 1920, has been set.

To assist in the fulfillment of this schedule a large concrete, steel and brick addition, four stories in height, 70 x 160 ft., has been completed recently and new machinery of modern design and construction, valued at more than \$500,000, is being installed as rapidly as possible so that the daily combined production of the two engines will, within the next few weeks, amount to more than 60,000 engines, or an annual output valued at more than \$10,000,000.

A contract has been let for a second addition, involving an outlay of \$175,000. This will permit of increasing the yearly output by 40,000 engines, thus bringing the yearly total up to 100,000 engines to be divided proportionately between the four cylinder and six cylinder models.

MAGNETIC EXPANDS PLANT

MILWAUKEE, March 8—The Magnetic Mfg. Co., 764 Windlake Avenue, Milwaukee, is erecting a new plant, 60 x 150 ft. It makes magnetic separators for smelters, foundries and other metal-working shops and will increase its output 300 per cent by May 1. R. H. Stearns is president.

AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

VOL. XLII

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Shall We Put the Airplane to Work in America?

The future of the aviation industry in this country depends upon the success of the manufacturers in taking advantage of the transportation opportunities before them. This article reveals some of the results of the recent aircraft show in New York and discusses the problem of the commercial airplane.

THE American Airplane must go to work as quickly as possible.

The contact of engineers, builders and traffic men last week on the occasion of the exhibition conducted by the Manufacturers' Aircraft Association at New York, to a large extent clarified the methods whereby this can be done. Three distinct phases of the developments will be considered here.

1. The manufacturers asserted that the reliability and maintenance of their machines, while not yet ideal, had been greatly improved from the military standpoint. The life and accessibility of engines have been greatly improved and one manufacturer said that he believed that the life of his engine might reach 2000 hr. with overhauls. Guarantees, however, have not reached that point and the statement was not made for publication but in confidence. Nevertheless it points the trend of the day.

2. Col. Jesse G. Vincent, president of the Society of Automotive Engineers, vice-president and chief engineer for the Packard Motor Car Co., and a leader in war-time aeronautic engine developments, pointed out along what lines development was needed.

3. R. E. M. Cowie, vice-president of the American Railway Express Co., announced a willingness of that company to contract for cargo space to an extent that would justify the organization of a \$1,000,000 airplane traffic company. Following his talk at the Aero Show, Mr. Cowie made a direct statement of his position for AUTOMOTIVE INDUSTRIES.

There is an interesting point of contact between Colonel Vincent's suggestion and that of Mr. Cowie. Colonel Vincent's outline was the development that can be made by using airplanes for carrying mail. Unfortunately such use is not assured. The House of Representatives has dropped all appropriations for airplane mail. The Senate has included such appropriations. So this development is as uncertain as anything political. Mr. Cowie's proposal for the use of airplanes in carrying express contemplates a similar use, but the plan must be carried out by private investment. This might be unfortunate for investors for a time, but possibly would be better in the end for getting results.

Now we will reverse the order of the points made and take them up in more detail, beginning with Mr. Cowie's message to the aircraft industry:

"Let me first make my position clear. The American Railway Express does not own, and will not own, transportation facilities. It merely contracts with existing transportation and, through contracts, aids the development of better facilities. I am a believer in aircraft and my investigations in Europe lead me to say the day of the airplane is here.

"Whenever it can be demonstrated—and I believe the means are already available—that a regular and dependable service by airplane can be maintained between certain large commercial centers, like New York and Chicago, it is planned by the American Railway Express Co. to contract with such an airplane operating company for cargo space and to offer this novel service to the public as the next evolution in the transportation of express parcels."

In his statement to AUTOMOTIVE INDUSTRIES, Mr. Cowie revealed more of the demands of his company and outlined more clearly just what he had in mind. This was simply that the airplane must go to work, as has been necessary in the growth of other business and earn its "bread and butter" by performing a distinct service to the shippers of the country.

"What have we to-day?" he asked. "Not much more than planes that fly to Atlantic City. In Europe, there are companies maintaining regular service and carrying goods day by day. And what do we do here at home? We get up a marathon across the continent, use old and antiquated equipment, something like a dozen planes finish and eight or ten men are killed."

A Large Stock Company

Mr. Cowie has had the airplane development under consideration for two years. He is in touch with the developments in Europe as the American Express Co.—a component of the railway express company—acts as a general forwarding agent and utilizes space in some of the successful aerial lines there. He has talked with designers and builders and already has had several proposals. Mr. Handley Page, head of the English airplane firm, is now in America and has attempted negotiations with Mr. Cowie. The results of these, of course, cannot be forecasted.

But Mr. Cowie believes, as he has stated to builders, that the airplane companies of America should act either jointly or singly in forming a large transportation company, with a capital of not less than \$1,000,000. Its first work would be a line between New York and Chicago, having stops at Syracuse and Cleveland, where the express would be trans-shipped just as it now is at division or similar railroad points. The initial equipment should not be less than six planes.

"We stand ready to contract at once with such a service," he said. "We will not institute the service because that is not our province. The express company does not own railroads and steamship lines but it contracts for their facilities and the business is handled in that manner. We will do exactly the same with an airplane company."

It may be said that the airplane builders of America are making their sales to-day to individual pilots who expect the bulk of their revenue will come from taking passengers into the air upon a charge of \$1 a minute, thus "cashing in" on the curiosity of sportsmen and others of adventurous spirit. The show was a witness to such a plan, the majority of makers concentrating principally upon showy passenger planes, only two distinct freight machines having been displayed—one of which has not been off the ground. The Cowie plan, based upon his

knowledge of railroading and transportation, is that this passenger business is of minor consideration and that the carriage of mail and express presents a larger field and dwarfs all other projects.

The express business would require a nine-hour run between New York and Chicago, with special rates of such magnitude that maintenance, operating and investment expenses could be met. The volume possible for such a service cannot be predicted, Mr. Cowie declared, but he is positive that American business will offer the freight and pay the costs—but the builders first must produce the planes and put them into operation. He amplified this by the following statement:

The Express Traffic

"It is my opinion that there is an unmistakable place for the airplane in connection with express service, the very essence of which is speed. To-day the express service, under a unified management, extends over every railroad in the United States, 285,000 miles, with 28,000 offices, with 135,000 people upon its payrolls, utilizing in its daily operations 3500 motor trucks and 17,500 horse-drawn vehicles, transacting a business of more than \$300,000,000 a year.

"This immense traffic consists mainly of the valuable merchandise of the country, and is made up of approximately 1,000,000 shipments a day. Many of these packages are of extreme urgency in their nature, and it is the respectively lightweight, non-bulky packages of an unusually urgent character that will naturally seek the expedited service that is now made possible by the airplane. I am satisfied there are many such, but no man in advance can tell what the volume may ultimately be.

"Suffice it to say that it would be passing strange if out of more than a million packages a day a small percentage of them were not of sufficient urgency to justify the cost that would be necessary to transport them by the quickest means of transportation that may be available, and, as will readily be seen, an almost infinitesimal proportion of the volume of express traffic moving would form a substantial cargo for airplane transport. My belief is that such a service would very quickly create a patronage peculiar to itself."

Colonel Vincent approached the commercialization of the airplane through the medium of the government mails. Thus he spoke for those favoring government aid and subsidies, a plan that has received a severe setback by the recent action in refusing appropriations for the mail service. The proposals, however, remain before Congress and have not been settled. Mr. Vincent's speech was delivered at the aeronautical dinner of the S. A. E., held at New York the night of March 10. It follows:

The Aerial Mail

"We had expected to have Otto Praeger, Second Assistant Postmaster General, with us to-night but unfortunately sickness in his family prevented his coming. As you all know, Mr. Praeger has been closely associated with the development of our aerial mail and I am sure that his enforced absence at this meeting is a distinct loss as he would undoubtedly have been able to give us some very important facts and figures bearing on the cost of aerial transportation. In his absence, I am going to take the liberty of briefly discussing the possibilities of our aerial mail from an engineering and production point of view.

"My remarks will be based on the fact that what we are all after is to be reasonably well prepared in the air for possible emergencies. The question is, therefore, what is the best way to accomplish this result. It is obvious

that anything that will promote the use of airplanes and thereby develop the art and make airplanes available, will be along the right lines. It is also obvious that during the next few years, at least, such development must be brought about, to a large extent, under government direction and with government funds.

"Granting that this is so, it is up to the government to determine the best way to bring this development about. We all know that the best way to bring about a development is to have a real use for the article which is to be developed.

"The government has such a use for airplanes in the mail service. I believe that all will agree that our aerial mail service has been well handled, and that, considering the appropriations available, desirable results have been obtained.

"Why not go after this mail service in a wholehearted manner and bring about the development that will be bound to result, if the mail service is really taken seriously and properly extended throughout our country. Such a course of procedure would, in my opinion, bring about the following results:

Increased Reliability

"a—Airplanes of greatly increased reliability would be evolved because, in this service, planes must fly on schedule time and failures would, therefore, be brought forcibly to the proper authorities.

"b—Airplanes of greater cruising radius would be evolved, as in this service it is desirable to fly for long distances without landing.

"c—The cost of airplanes would be gradually brought down to a proper level because manufacturers would receive sufficient orders to enable tooling up.

"d—Economical, reliable aircraft engines would be developed for this service and, as the quantities required would permit of tooling up, it follows naturally that such engines would be obtainable on short notice at minimum cost. Contrary to popular opinion, these engines could be developed so that they would be equally good for the mail service and for military purposes. Such a development would be of paramount importance because it takes at least a year to develop an airplane engine and get it into production even under war-time pressure, while the airplane itself can be designed and gotten into production in less than one-third the time providing the engine to be used in it is a known quantity.

"e—Many improved instruments for airplanes would be developed, including such important ones as are required for night flying, flying in cloudy weather, etc.

The Pilot Personnel

"f—Instead of losing all the technical knowledge and expert artisans which were developed during the war, as is now rapidly taking place, such a program would gradually increase technical knowledge and develop craftsmen, so that in case of any emergency, material for a war-time aircraft organization would be immediately available.

"g—There would be a constant demand for good reliable pilots, with the result that we would always have a large number of good pilots in training, who would be immediately available in case of an emergency.

"h—Such a program, by keeping the aircraft industry alive, would promote the development of commercial aeronautics, which would, in turn, not only

hasten development that would help the aerial mail service but, what is more important, would make available much added technical knowledge and manufacturing facilities for use in case of an emergency.

"i—Probably the most important move that is required in order to make the development of commercial aeronautics possible is to obtain a complete system of good landing fields throughout the country. Obviously, the government cannot be expected to build or maintain such fields, but the expansion of the aerial mail would, in my opinion, bring about the desired result. These landing fields would be provided by the cities to be served by the aerial mail and I can think of nothing that would stir up so much interest in commercial aeronautics as a system of landing fields throughout this country with mail planes going and coming regularly every day.

"j—In case of emergency, if such a program were in swing, we would have a great number of airplanes and pilots which could be made ready quickly to do very valuable service for the Army and to a certain extent, for the Navy. It is, of course, true that these planes would not be military machines but they could be so constructed—without interfering with their value as mail carriers—that with the addition of some armament which could be very quickly installed, they would be very good for observation, photographing and bombing work.

"k—Last, but not least, a program of this kind would result in the maximum amount of activity and development at the minimum cost to the government for the reasons as stated above, i. e., the government has a job to do and by using airplanes to do it, the revenue accruing from such operations would be applied toward cost of equipment and maintenance.

Experimental Work

"I understand experience to date indicates that the aerial mail service can be made, almost, if not entirely, self-supporting after being established. This should not be taken as too important a consideration as, in order to bring about the results desired, it will be important to have sufficient appropriations to keep experimental work constantly going on with the view of bettering equipment from month to month.

"I have given this matter considerable thought and the more I think about it the more I realize the possibilities of bringing about a wonderful development in aeronautics through the use of aerial mail as a vast proving organization. I feel sure that if such a program could be made a reality, there would be absolutely no question but what the United States would lead the world in aeronautics inside of a very few years.

"In closing, I would like to point out that, when we entered the recent war, the government had no trouble in obtaining prompt delivery of passenger cars and trucks simply because such vehicles had been thoroughly developed and were in quantity production for other uses. In my opinion the aerial mail offers a possibility of bringing about the same condition in aeronautics—firstly by making mail-carrying planes and pilots immediately available in case of emergency, and secondly, by bringing about the commercial use of airplanes which, in the final analysis, in my opinion, is the real answer."

The American airplane industry must fight for its place in business during the coming year. The financial future of some of the companies is not clear and how they will survive 1920 depends upon the efforts that will be made to keep them alive. Already a great deal has

been done and sturdy planes been perfected. But even so, much experimentation, much change and many improvements are necessary before the airplane will have become one of the great transportation machines of the United States. The military experience and construction form the ground work from which this structure will be built up.

"We have much work before us," one of the designers of a large engine building company said during the show. "But it is much less than what we already have undergone. We have the basic engine but we face its conversion into an engine that will meet the needs of a commercial plane."

This manufacturer would not estimate the possible life of his engine under any conditions but he did state that construction practice tended toward sturdier and heavier machines that would have greater durability and be easier and less costly to overhaul and repair. Another manufacturer said that he had operated engines in recent months for 400 hr. without an overhaul, whereas previously his field had had a standing rule for a complete overhaul after 55 hr. flying time.

"The life of a motor, properly overhauled, handled and cared for, may be set at 500 hr. before it has practically to be rebuilt or used as salvage," said a pilot who has had continued experience with one of the larger builders. "That is to say about 40,000 miles when used for cross-country trips. This estimate is with average mechanics, but, with first-class mechanics and good equipment in the shop and hangars, 1,000 hr. is not an excessive estimate."

However, any estimate of the airplane engine to-day can only be along broad lines and must be inconclusive. The same may be said of the propellers and the plane structure, except that the latter should be measured in months and not in flying time.

"The wings and tail surfaces of present-day machines should last from eight months to a year without being recovered," the same pilot said. "If properly built and varnished, they should stand being covered two or three times. It is only recently that dopes have been developed which do not deteriorate rapidly. Pigmented dopes have

been brought to the point where they may be depended upon to hold the pigment and so shut out the actinic light, one of the worst enemies of the dope film.

"The fuselage should last for several years, particularly if of monocoque or semi-monocoque construction. The landing gear is usually injured long before it can be affected by wear. Tires are never worn out; they are 'pulled'—that is, burst or pulled out of the rim. The elastic cord used as a shock absorber will experience fatigue in time and must be rewrapped. This also is usually broken before it loses sufficient elasticity to be rendered useless. Thus it may be seen that the life of the landing gear depends chiefly on the skill of the pilot and the character of the landing field."

Along with the continuation of design and engineering improvement must go that relating to operations and personnel. Landing fields and facilities must be provided, fliers must be trained in commercial work and the instruments of direction finding, radio, telephone, and signaling, and warning signs and mapping must be kept up and got under way. Mr. Cowie expressed the belief that the Interstate Commerce Commission should exercise the same supervision over aircraft transportation that it does over that of the railroads. Others believe that a separate department of the Cabinet should undertake such supervision. All, however, are agreed that some agency should be provided, and that the quicker it comes the better it will be for the industry.

Whatever may be the outcome of the struggles of the airplane industry, now that the prop of war-time necessity has been knocked from under it, the New York exhibition made plain the statement that the aircraft must go to work. The day of the exhibition flier seems to have been ended, or to be approaching its death, and the carrying of curiosity-seekers is no more than a temporary expediency. The airplane must become an agency for the transportation of express, mails or passengers who seek not thrills but to be carried from one place to another.

European makers have begun this work. How will the Americans perform the same service?

Stopping Leaks in Fuel Tanks

DURING the war numerous experiments were made with the object of securing a means for easily and quickly closing rents in gasoline tanks, says *La Technique Moderne*. Toward the end of 1916 the testing laboratory of the *Conservatoire National des Arts et Metieres* was requested to analyze and test a special putty, called Ob. The analysis gave the following results:

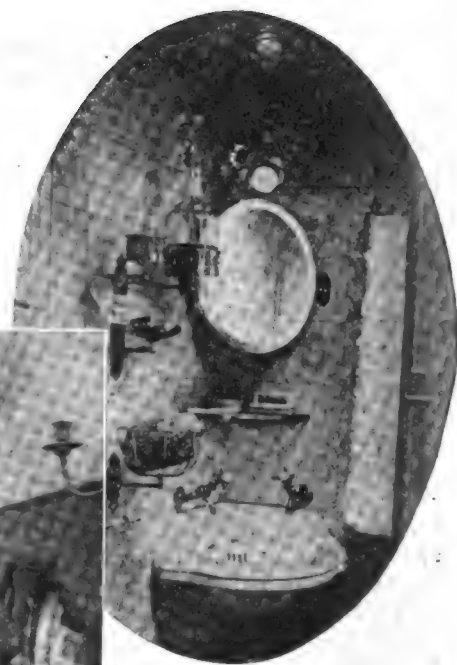
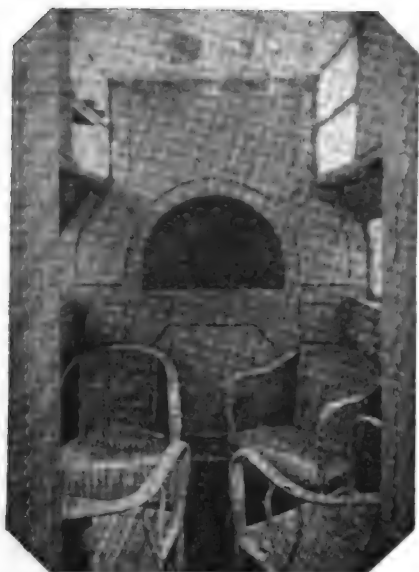
	Per cent
Soaps { fatty acids	17.05
alkalies	3.60
Glycerine	4.00
Water	21.45
Various mineral materials	53.90
	100.00
	Per cent
Clay	95.20
Lime	3.00
Magnesia	0.40
Sulphuric acid	1.40
	100.00

In order to determine how this putty behaved under the influence of vibration, a 40-gal. tank was mounted on a light motor truck. Nine holes were punched in it, varying in diameter from 0.4 to 0.8 in. and located at different heights. These holes were closed up by means of plugs made from the paste or putty under test.

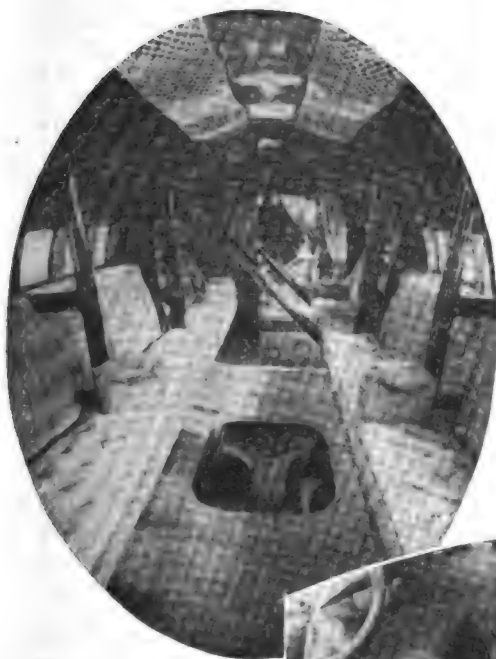
The truck was driven a distance of 34 miles over bad roads at an average speed of 13 m.p.h. A single crack formed in one of the plugs and this was stopped by applying more of the putty. After 23 hours of testing there was no oozing out of liquid at any of the plugs and the conclusion was reached that this putty or cement may render great services in stopping leaks in fuel tanks.

ACCORDING to a paper read by M. Martinot-Lagarde, before the Society of Civil Engineers of France, the production of aircraft engines in that country increased from 40 per month in August, 1914, to 4200 in October, 1918, or from 900 per year in 1914 to 34,000 for the first ten months of 1918. During the war a total of nearly 90,000 aircraft engines were built, representing an aggregate work of 100,000,000 man-hours, an output of nearly 20,000,00 hp. and a cost of 2,000,000,000 francs.

European Refinements of Passenger Carrying Airplanes



These photographs, which are self-explanatory, were taken at the recent Paris aircraft show, and evidence the strides that are being made to overtake the European commercial field



Several machines of leading make are represented here, this phase of development in Europe having been pushed much more than it has in America



Technical Features of the New Aircraft Models

Supplementing the article in last week's issue on the New York aircraft show, the one herewith gives an engineering description of some of the features of the new planes. Necessarily brief, the sketches, made by a staff artist, are a worth while addition as they indicate how the designers have met some of the construction problems

ACCESSORIES and instruments at the recent aircraft show at New York reflected the recent rapid development of aircraft. A particularly interesting series of banking indicators, turn indicators, air speed indicators, air distance recorders, etc., was shown by the Pioneer Instrument Co. The Pioneer air speed indicator is a striking example of how aircraft instruments may be simplified to advantage, both as regards reliability and cost of manufacture. This instrument consists of a simple pitot tube designed for mounting on wing struts or other convenient positions, which is connected by tubing to a glass tube indicator operated on the U gage principle and calibrated to read directly in miles per hour. This apparatus should be reliable when once calibrated, providing, of course, that it is properly mounted on the aircraft, where it will be free from air interferences.

With the exception of the Curtiss C-12, Wright-Hispano Model K, and L-W-F Cato, the engines shown are familiar to readers of *AUTOMOTIVE INDUSTRIES*. The Curtiss C-12 is a 12-cylinder, Vee type engine, resembling closely this company's K-12 engine. Details of the new model are not available. The Wright-Hispano Model K is a geared down Vee type with a 37 mm. gun mounted between the banks of the cylinders and arranged to shoot through the hollow propeller hub. This arrangement made necessary a considerable number of changes from the Wright-Hispano Model H. The L-W-F Cato is a two-cylinder opposed air-cooled engine designed specially for the L-W-F single seat "Butterfly."

Aeromarine Model 40 L.—This machine is a two-seater sport type without any radical features. The hull follows typical Aeromarine lines and the boat in general is finely finished, although not to the degree of refinement attained in this company's Model 50-B. Among the interesting details noted was the provision of pockets for books or papers in the backs of the seats. A transfer is applied to each instrument board cautioning the pilot not to operate his engine at wide open throttle where avoidable, and to fly over water in preference to over land where possible. The power plant consists of an Aeromarine L-6-D, also Curtiss OXX6 is given in the catalogue as optional equipment.

Curtiss Eagle.—This machine is similar to the three motored Curtiss Eagle exhibited at the Chicago show. The third engine installed in the fuselage nose of the original Eagle has been eliminated in this model, and the two K-6 wing engines have been replaced by C-12's, thus reducing the number of engine units, but increasing the total horsepower. The installation of the heavier engines on the wings made it necessary to move these units further forward. They are carried by bracing extending forward from the front wing struts. On the

whole, the new arrangement makes a cleaner appearing job than the three engined model. There is no overlapping of propeller slip-streams, such as existed with the original arrangement, and the increased horsepower should give considerably better performance, while at the same time giving the pilot one less unit for attention.

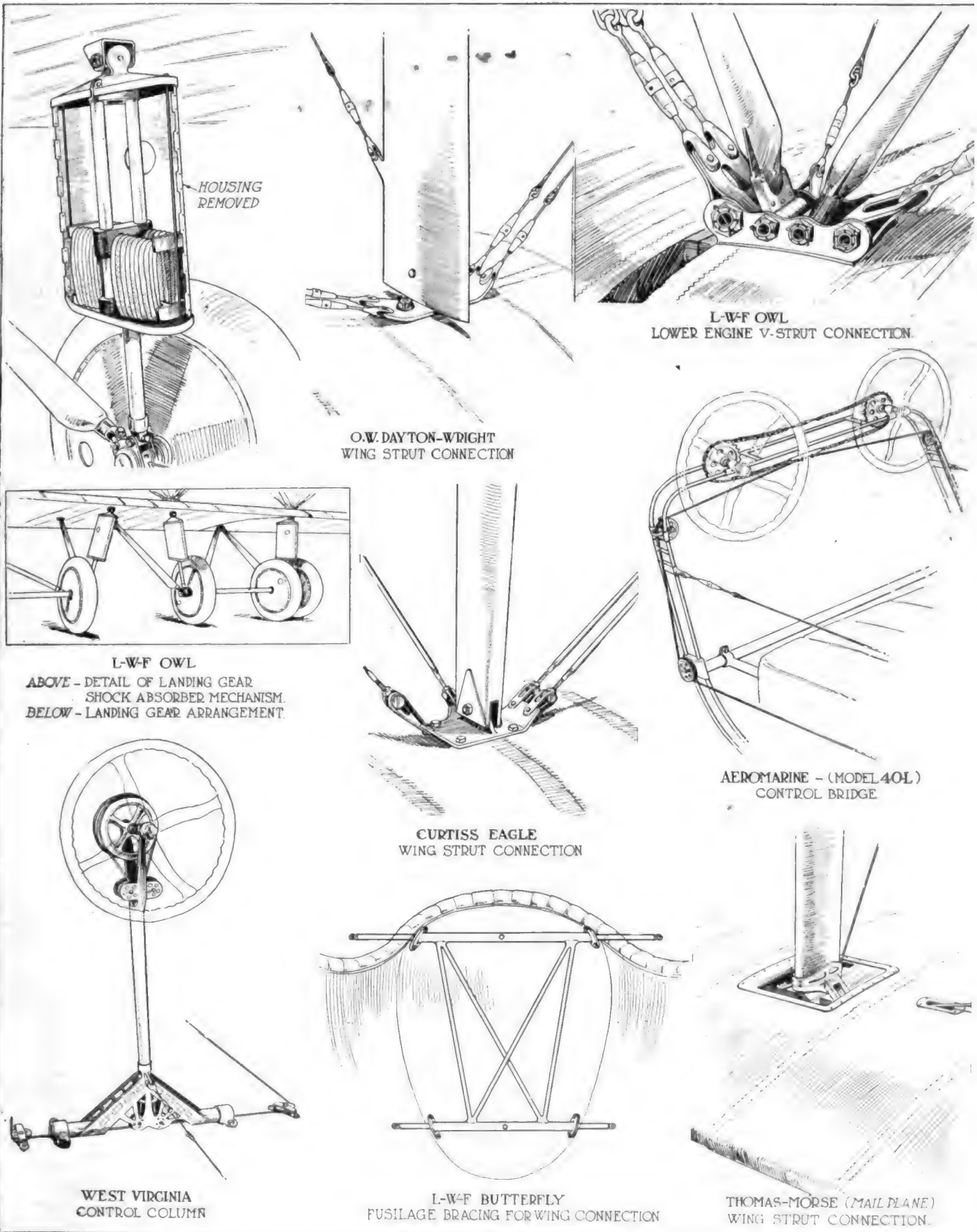
The upholstery, which in the original model was whipcord, has been changed to gray leather, and toilet facilities have been provided at the rear end of the cabin. This is the first American airplane so equipped and serves to illustrate the refinement in aircraft. It is questionable, however, if such use will be permitted when aircraft operation is regulated by law.

L-W-F Model L "Butterfly."—This machine was one of the most striking exhibits at the show. It is a small monoplane of 29 ft. 9 in. span and 19 ft. length, the total weight empty being given as 595 lb. The monocoque fuselage gave the machine an extremely fine appearance for a low-priced machine, it being listed at \$2500 f. o. b., College Point, L. I. The elevators and rudders are interchangeable and bracing from control horns has been so worked out that a single wire in direct line with the operating wire is used, thus eliminating the second bracing wire usually found necessary on control horns. The entire machine is designed with a view to providing maximum interchangeability. Many of the wing struts and many wires throughout the machine are interchangeable. The design permits of rapid assembly, practically no adjustments being necessary in the field.

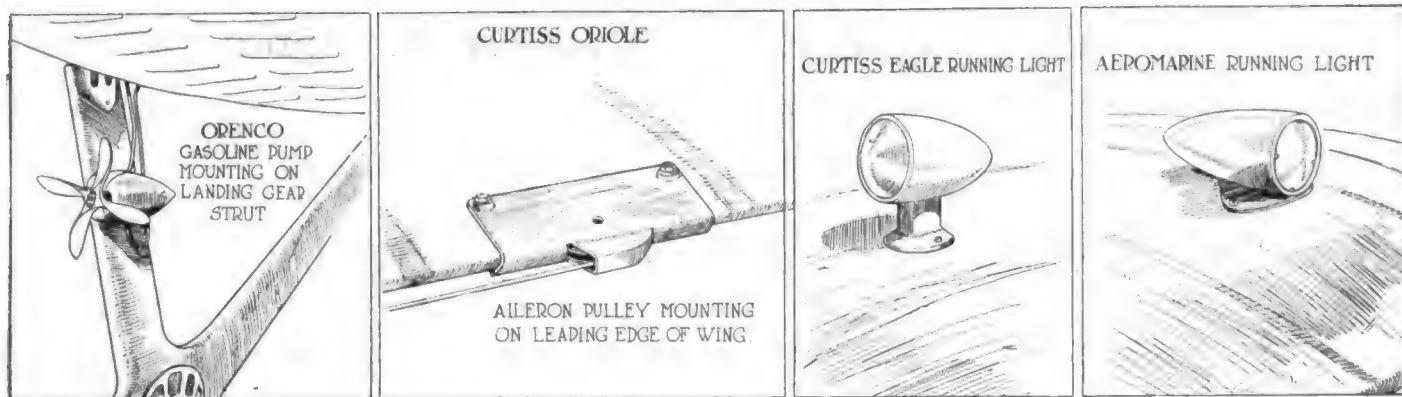
The power plant consists of a two-cylinder horizontally opposed engine of 5 in. bore by 6 in. stroke. The engine is also manufactured by the L-W-F company. It is mounted on two cast aluminum alloy brackets, which are in turn bolted to a plywood bracing plate fastened to the front end of the fuselage. The streamline housing covers the engine, with the exception of the cylinder cooling fins. The oil tank is mounted on the fuselage floor in the rear of the engine supporting plates, while the gasoline tank is mounted directly in the back of the instrument board. On the whole, this machine is a fine production proposition, and it would appear to be quite practicable to turn these machines out for list price of \$2500 and still maintain a good standard of workmanship.

L-W-F Model H, Aerial Freighter or Mail Plane.—This machine, which towered above all of the others at the show, was designed for the aerial mail service to carry 3000 lb. mail on long flights or 6000 lb. on short flights. It has a wing span of 105 ft., gap of 11 ft., and a total area of 2200 sq. ft. The weight empty is 12,400 lb., or fully loaded approximately 20,000 lb. A biplane tail is carried by two monocoque fuselages of some 50 ft. overall length.

Technical Details of the American Planes



These sketches were made by a staff artist at the recent New York aircraft show



Other details featured at the New York aircraft show

Three Liberty-12 engines are provided, one in the nose of each fuselage and a third in the nose of the central nacelle. This nacelle also carries the main mail compartment. The pilot's cockpit, equipped with dual controls, is located in the rear of this nacelle. Auxiliary mail compartments are provided in each fuselage.

The landing gear is comparatively simple, considering the large weight to be carried. The shock absorber arrangement is strongly reminiscent of Handley Page practice and consists of a rubber shock absorber cord mechanism enclosed in a streamline housing.

On the whole the machine presents a good appearance and gives the impression of being thoroughly practicable. The fuselages impress one as being somewhat longer than necessary for the design, but this impression may be partially due to their small diameter in comparison to their length.

Orenco Type F 4-Seater Airplane.—This machine is characterized by a somewhat unusual seating arrangement, which should prove popular. Two cockpits are provided, each having a double seat, giving a total seating capacity of four. This arrangement would appear to

be a move in the right direction, as tandem seating undoubtedly gives one a feeling of loneliness. While it is true that the rattle of the exhaust prevents conversation, this will most certainly be eliminated by the use of efficient mufflers, and it seems advisable for designers to take this into consideration, as the installation of a muffler can be made at any time without other alteration of a machine.

The Orenco type F is equipped with a Hispano-Suiza 8-cylinder, 150-hp. engine, and weighs empty 1477 lb., or fully loaded 2432 lb. The machine presents a clean cut appearance and no radical ideas have been incorporated, unless the seating arrangement may be so regarded. Another noteworthy feature which should appeal to sportsmen is the fact that the upper and lower wings are interchangeable.

Thomas-Morse Air Mail Plane.—In order to meet the requirements of the Post Office Department for mail planes, the Thomas-Morse company designed their Transcontinental Air Mail Plane, a machine of 45 ft. 6 in. span, 25 ft. 5 in. long, having a total wing area of 632 sq. ft., the weight empty being 2890 lb., and fully

TECHNICAL SPECIFICATIONS OF AIRPLANES

Exhibited at the New York Aircraft Show

(March 6 to 13, 1920)

Manufacturer and Model	GENERAL					ENGINES			WING DATA				WEIGHTS		PERFORMANCE		
	Type	Use	OVERALL		Carrying Capacity	No.	Make	Total B.H.P.	Span	Chord	Gap	Total Wing Area	Empty	Full	High Speed	Low Speed	Climb
			L'gth	H'ght													
Aeromarine-40-L	PB Boat	S	Ft. In. 28-11	12- 7	2	1	Aeromarine L-6	130	Ft. In. 48- 6	Ft. In. 6- 3	Ft. In. 6- 6	Sq. Ft. 504	Lbs. 2,161	Lbs. 2,799	M.P.H. 76.0	M.P.H. 44.0	2400 ft. 10 min.
Aeromarine-50-B2	PB Boat	S	28-11	12- 7	3	1	Aeromarine B-8	150	48- 6	6- 3	6- 6	504	2,286	3,276	75.0	45.0	2200 ft. 10 min.
Curtiss-2 Motored Eagle	TB Land	P	56- 7	12-11	10	2	Curtiss K-12	800	64- 4	.....	7- 9	.....	5,310*	8,890*	124.5*	56.0*	.....
Curtiss Oriole	TB Land	S	25- 0	9- 0	3	1	Curtiss K-6	150	36- 0	5- 0	.....	1,564	2,354	96.0	51.0	3700 ft. 10 min.	
Curtiss Seagull	PB Boat	S	28-10	11- 9	3	1	Curtiss K-6	150	40- 9	.....	.....	1,957	2,726	76.5	48.5	3000 ft. 10 min.	
Curtiss-JN-4D2	TB Land	S	27- 4	9-11	2	1	Curtiss OX-5	90	43- 7	.....	.....	1,535	2,025	75.0	45.0	2000 ft. 10 min.	
Curtiss Standard J-1	TB Land	S	26- 7	10-10	2	1	Curtiss OX-5	90	43-11	.....	.....	1,448	2,025	68.0	37.0	2600 ft. 10 min.	
Dayton-Wright OW	TB Land	S	28- 6	9- 0	3	1	Hispano-Suiza or Packard-8	180	46- 0	6- 6	5- 7	534	1,450	2,492	95.0*	35.0*	6000 ft. 10 min.
Dayton-Wright KT	TB Land	S	30- 2	11- 2	3	1	Liberty-12 or Packard-12	420	43- 7	5- 6	5-10	441	2,686	4,128	120.0	55.0	10,000 ft. 10 min.
L-W-F-L (Butter- fly)	TM Land	S	19- 0	5-10	1	1	L-W-F Cato	72*	29- 9	7- 0	.....	187	595	978	72.0*	30.0*	*4800 ft. 10 min.
L-W-F-H (Owl)	TB Land	For M	53- 9	17- 6	4 and 3000 lbs.	3	Liberty-12	1200	105- 0	11- 0	11- 0	2200	12,400	20,000	110.0*	55.0*	*6000 ft. 9 min.
Orenco F	TB Land	S or P	25-10	9- 0	4	1	Hispano-Suiza	150	38- 0	5- 0	5- 0	355	1,477	2,432	90.0	43.0	5000 ft. 9 min.
Thomas-Morse Mail- plane	TPB Land	For M	25- 5	11- 0	2 and 1500 lbs.	2	Hispano-Suiza	600	45- 6	8-10	6- 3	632	2,890	5,500	130.0	55.0	10,000 ft. 14 min.
West Virginia-C	TB Land	S	27- 0	9- 9	3	1	Hispano-Suiza	150	44- 5	6- 0	5- 1	435	1,700	2,400	77.0	40.0	4000 ft. 10 min.
									34-10								

KEY TO NOTATION:

F—Freighter.
M—Mail Carrier.
P—Passenger.
PB—Pusher Biplane.

S—Sport.
TB—Tractor Biplane.
TM—Tractor Monoplane.
TPB—Tractor-Pusher Biplane.

*Estimated by manufacturer.

TECHNICAL SPECIFICATIONS OF AIRCRAFT ENGINES

Exhibited at the New York Aircraft Show

(March 6-13, 1920)

Manufacturer	Model	Type	Cooling	Cylinders			Ignition	Carburetor	Oiling	Horsepower	Consumption in lbs. per B. H.P.-Hr.		Weight, lbs.
				Number	Bore	Stroke					Gas.	Oil	
Aeromarine Plane & Motor Co.	B	90°-V.	Water	8	3.625	5.125	Two Dixie-800	Zenith Duplex	Pressure	148 at 1300 166 at 1500 130 at 1625	....	....	460
Aeromarine Plane & Motor Co.	L	Vert.	Water	6	4.250	6.300	Two Delco	Two	Pressure	130 at 1625	0.53	0.03	375 405, with start. and gen.
Curtiss Aeroplane & Motor Corp.	K-12	V	Water	12	4.500	6.000	Two H.T. Mag.	Two Duplex	Pressure	375 at 2250	0.55	0.03	728
Curtiss Aeroplane & Motor Corp.	K-6	Vert.	Water	6	4.500	6.000	Two H.T. Mag.	Duplex	Pressure	150 at 1700	0.55	0.03	417
Curtiss Aeroplane & Motor Corp.	OX-5	V	Water	8	4.000	5.000	H. T. Mag.	Duplex	Pressure	90 at 1400	0.50	0.03	390
Lawrance Aero Engine Corp.	L-2	Static	Air	3	4.250	5.250	Philbrin	Zenith Stromberg	Pressure	60 at 1800	....	....	140
L-W-F Engineering Company	Cato	Radial Horis. Opposed	Air	2	5.000	6.000	Mag.	Zenith	....	72† at 1825	....	....	154
Packard Motor Car Co.	1-A-744	90°-V	Water	8	4.750	5.250	Double Delco	Zenith	Pressure	160 at 1525	....	....	585
Wright Aeronautical Corp. (Wright-Hispano)	E	90°-V	Water	8	4.724	5.118	Two Dixie-800	Stromberg	Pressure	180	....	....	470
Wright Aeronautical Corp. (Wright-Hispano)	H	90°-V	Water	8	5.511	5.905	Two Dixie-800	Stromberg	Pressure	300	....	....	620
*Wright Aeronautical Corp. (Wright-Hispano)	K	90°-V	Water	8	5.511	5.905	Two Dixie-800	Stromberg	Pressure	300	....	....	791
Hall Scott Motor Co.	L-6	Vert.	Water	6	5.000	7.000	Delco	Miller or Zenith	Pressure	215 at 1700	0.50	0.03	495

*Geared, 1.44 to 1. Gun mounted to shoot through propeller hub.

†Estimated by manufacturer.

loaded 5500 lb. Two fuselages are provided, each fuselage carrying an independent tail. The control systems are connected at the forward part of the machine. Two 300 hp. Hispano-Suiza engines are installed in the center nacelle, which also carries a mail compartment. A single Albatross type of wing radiator is installed in the upper wing immediately above the nacelle and is provided with a deflector for regulating the flow of air.

Single cockpits are provided at the extreme front of each fuselage, the left hand cockpit carrying the pilot, while the right hand cockpit carries the mechanic. The pilot's controls are coupled directly, whereas the mechanic's controls are provided with flexible connections, enabling the pilot to take control from the mechanic at any time. This flexible connection is ingenious and is obtained by making the control stick in two parts, upper and lower, each part being provided at its end with a round flat plate. The stick is assembled by placing these plates face to face and lacing through both plates with rubber shock absorber cord, thus giving

a flexible connection. This control system has been thoroughly tried in the air and has been found to be practicable and convenient.

West Virginia Type C Airplane.—The West Virginia Type C is a three-seater machine designed and based on the JN lines, in so far as the wings and some other parts are concerned. The provision of three seats, however, necessitated such radical changes that practically an entirely new fuselage and landing gear was found necessary. The double seat is located in the front and no controls are provided. The pilot is located in the rear seat and provided with a control of the center column type. The power plant consists of an 8-cylinder Hispano Suiza, 150-hp. engine. A honeycomb radiator of somewhat artistic appearance is installed on the fuselage nose between the engine and propeller. The cockpits are both unusually roomy, but the forward one is not over-convenient to get into or out of, although considerably improved over the original JN, from which the machine was evolved.

Aircraft Fusion in Great Britain

COMMERCIAL interest in Great Britain has been considerably aroused, says the American Chamber of Commerce in London, by the announcement of the amalgamation of the Aircraft Manufacturing Co. with the Birmingham Small Arms Co., Ltd.

The former firm, of which Holt Thomas is the founder, chairman and managing director, are the makers of the Airco airplanes, which are employed on the London-Paris air mail service. The B. S. A. includes a number of firms and represents various interests, its products including explosives, arms, bicycles, and motor cars. The identity of the Aircraft Manufacturing Co. will be maintained and the manufacture of Airco airplanes will be continued under the direction of Mr. Thomas.

There is a tendency to regard this fusion as indicating what is likely to happen in the British airplane industry generally, unless there is some immediate change in the situation. Airplane manufacturers are compelled, through lack of support, either to cease business alto-

gether, or to produce airplanes merely as a side line. Commercial aviation in its present form does not offer strong inducements to business men. To make it attractive, it must be greatly expanded. The relation between overhead and running charges is still disproportionately and unnecessarily great.

War machines, converted for commercial flying, the American Chamber points out, at present can carry passengers from London to Paris at 100 m.p.h., at a rate of about 1/3d. a mile, while for goods transport the rate of 2/6d. per lb. for a small parcel can be reduced to 1/6d. for a consignment of 75 lb. and over. Owing to the speed, the time saved is enormous. A passenger picked up in London at 11 a.m. should reach Paris before 4 p.m. Parcels are delivered by air express well within a single day, and express letters travel between the two cities from door to door in about five hours. American business men on quick trips of investigation of British and continental markets have been heavy users of this service.

Some of the Changes in the New Engine Models

In the design of new engine types, the Waukesha Motor Co. has made allowance for the tendency toward fuel changes. The demands for pneumatic-tired trucks and higher speed engines also are taken into account. This requires stout crankcases and crankshafts and large bearing surfaces.

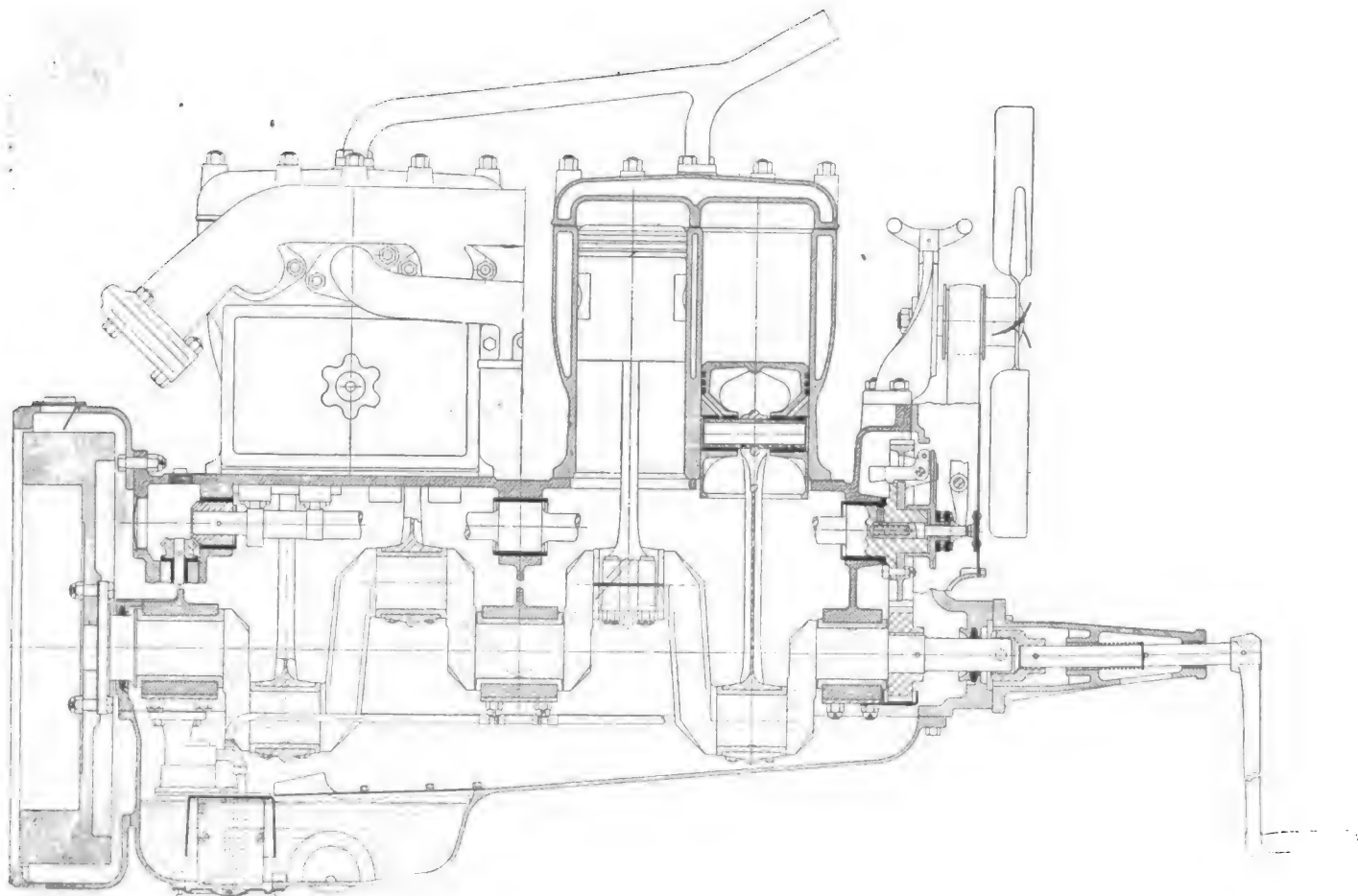
By J. Edward Schipper

IN preparing for the production of a new line of engines, the Waukesha Motor Co. has proceeded on the assumption that 1925 fuels will have reached an end-point of 500 deg. Fahr., and has provided a larger piston displacement per horsepower output desired, to allow for the greater expansion of the charge. It is recognized that an allowance must be made for the loss in weight of charge by preheating the mixture, and also for the loss due to the lower compression imposed by the detonation tendencies of these higher end-point fuels. To maintain the same power at given speeds, the displacement of these engines has been made 11 per cent greater than that of the previous engines.

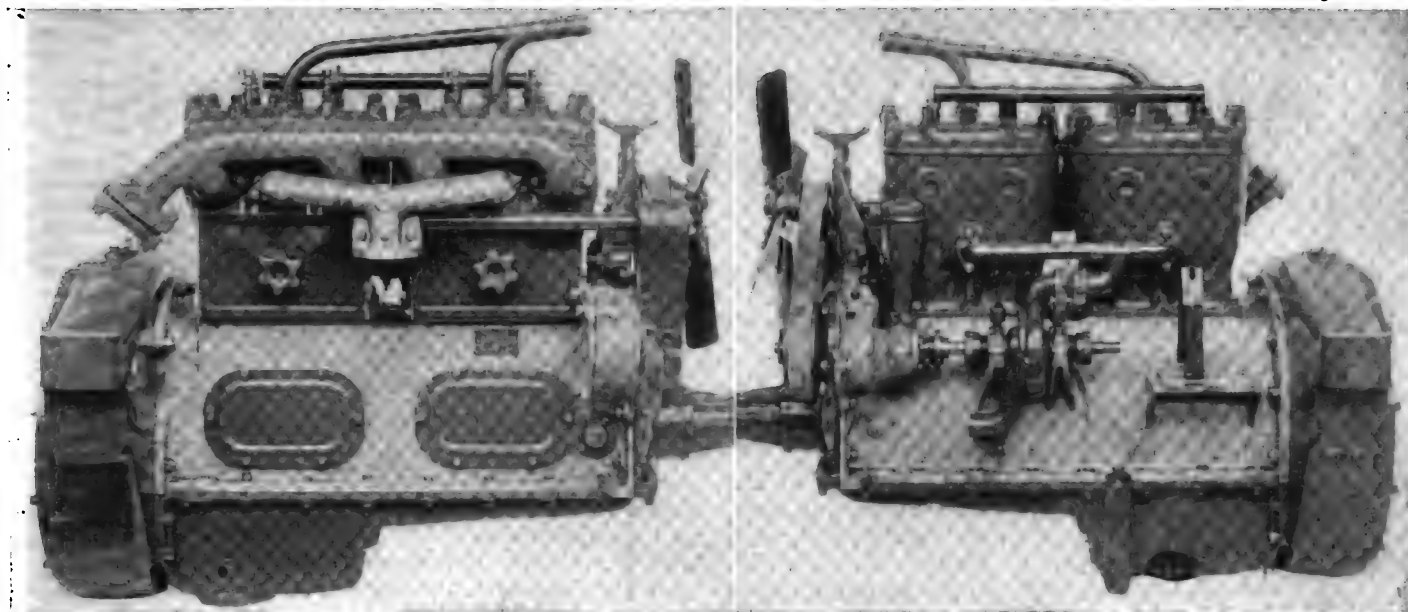
In order to take care of the demand for pneumatic-tired trucks, higher engine speeds will be necessary, and in or-

der to provide for this, stiff crankcases, crankshafts, and larger bearings are used. The connecting-rod bearings are located centrally in the pistons. Because smaller engines can be run at higher speeds, due to better cooling, and, since the crankshaft in this case must be relatively larger, the same diameter of crank is used in all engines from 289 cu. in. up to 492 cu. in. displacement. On all these engines the camshaft holes are of the same size, so that service reamers can be used on the main rods and camshaft bearings.

This series of engines has the L-head cylinders, cast in pairs with detachable head. They carry long iron pistons with three rings, all mounted near the top of the piston. The piston boss is a trifle below the center of the piston and the web above the boss is drilled for an oil lead to the



Longitudinal section through new Waukesha truck and tractor engine



Right side of new Waukesha truck and tractor engine

Left side of the U type Waukesha engine

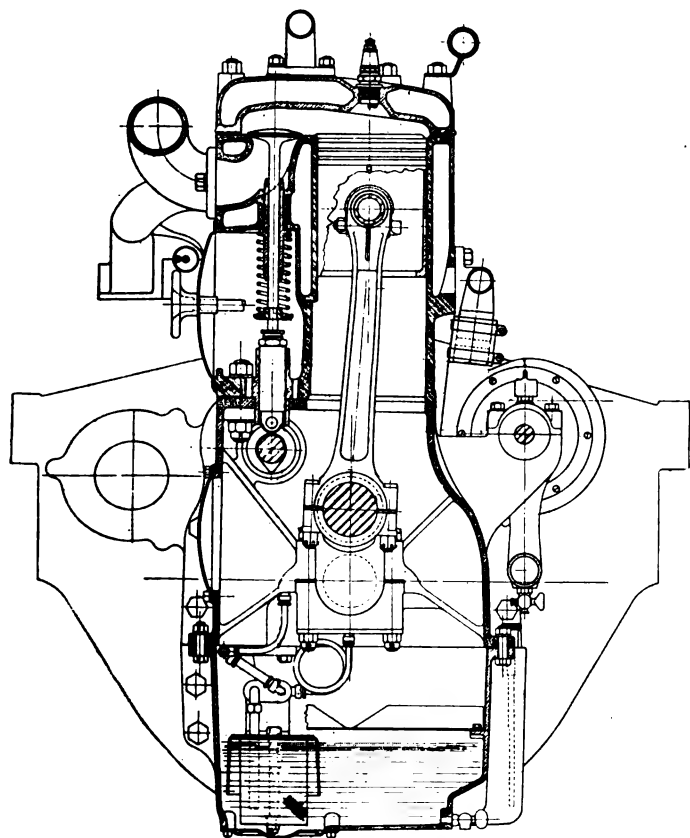
piston pin bushing from below the lowest ring. Thus the excess lubricant which is scraped off the cylinder walls is carried back to the upper side of the piston pin. The connecting rods are made of 0.35 per cent carbon steel, heat-treated, with the large end ground to fit the bearings. The bottom of the rod is designed to distribute the load to the center of the rod bearings for equal distribution.

The main and connecting-rod bearings have reinforced backs and are lined with Fahrig metal. The crankshaft is of chrome nickel steel, heat-treated. The valve push rods are $1\frac{1}{8}$ in. in diameter and are hollow, case hardened and

ground. They are of the roller type, with lock nut adjustment. The valves are of special alloy steel with split washers and are of the tapered type with a flat, case-hardened end.

Lubrication is by pressure feed to all of the main and connecting-rod bearings. The oil is circulated by a gear pump located in a sump in the bottom of the oil pan. The oil pump is removable from the exterior. Any standard make of magneto can be used on this engine. The detailed specifications of the different models are given in the table herewith:

Specifications	Model CU	Model DU	Model EU	Model FU
Bore	4 $\frac{1}{2}$	4 $\frac{1}{2}$	5	4
Stroke	5 $\frac{1}{2}$	6 $\frac{1}{2}$	6 $\frac{1}{2}$	5 $\frac{1}{2}$
Displacement	346 cu.in.	398 cu.in.	491 cu.in.	389 cu.in.
Valve diameter, clear..	2	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2
Connecting rod bearing...	2 $\frac{3}{8}$ x2 $\frac{1}{2}$	2 $\frac{3}{8}$ x2 $\frac{3}{4}$	2 $\frac{3}{8}$ x3 $\frac{1}{4}$	2 $\frac{3}{8}$ x2 $\frac{1}{2}$
Front main bearing....	2 $\frac{3}{8}$ x2 $\frac{1}{2}$	2 $\frac{3}{8}$ x2 $\frac{3}{4}$	2 $\frac{3}{8}$ x3 $\frac{1}{4}$	2 $\frac{3}{8}$ x2 $\frac{1}{2}$
Center main bearing...	2 $\frac{1}{2}$ x3 $\frac{1}{4}$	2 $\frac{1}{2}$ x3 $\frac{1}{2}$	2 $\frac{1}{2}$ x4	2 $\frac{1}{2}$ x3 $\frac{1}{4}$
Rear main bearing....	2 $\frac{1}{2}$ x3 $\frac{1}{4}$	2 $\frac{1}{2}$ x3 $\frac{1}{2}$	2 $\frac{1}{2}$ x4	2 $\frac{1}{2}$ x3 $\frac{1}{4}$
Piston pin bearing....	1 $\frac{1}{4}$ x2 $\frac{1}{2}$	1 $\frac{3}{8}$ x2 $\frac{1}{4}$	1 $\frac{3}{8}$ x2 $\frac{1}{2}$	1 $\frac{1}{4}$ x2 $\frac{1}{4}$
Connecting rod length...	12 $\frac{1}{4}$	13 $\frac{1}{4}$	13 $\frac{1}{4}$	12 $\frac{1}{4}$
Camshaft diameter.....	1 $\frac{1}{4}$	1 $\frac{1}{4}$	1 $\frac{1}{4}$	1 $\frac{1}{4}$
Timing gears, helical pitch	8	8	8	8
Timing gears, face....	1 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$
Piston rings, No.	3	3	3	3
Piston rings, width....	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
Spark plugs, S. A. E..	$\frac{7}{8}$ x18	$\frac{7}{8}$ x18	$\frac{7}{8}$ x18	$\frac{7}{8}$ x18
Carburetor flange, S. A. E.	1 $\frac{1}{4}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{1}{4}$
Exhaust manifold, bore.	2.505	2.505	2.505	2.505
Flywheel diameter	17 $\frac{1}{2}$	20	20	17 $\frac{1}{2}$
Flywheel housing, S. A. E.	2	1	1	2
Fan diameter	20	20	20	20
Water inlet, diameter..	1 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$
Water outlet, diameter.	1 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$
Weight	840	910	980	825



Transverse section through new Waukesha truck and tractor engine

FIGURES in possession of the French Aviation Ministry show that between the months of May and November, 1919, three air routes were established and operated, apart from irregular flights. These were between Paris and London, Paris and Lille, and Toulouse and Rabat, Morocco. It was announced that the Under Secretary for Aviation is planning a wide network of air routes across France and to the African colonies, as well as to England, Spain and Italy.

Truck Axles Withstand Seventy-Five Tons in Pressure Test

A new worm-driven axle is being produced in a factory, converted from the manufacture of printing presses, in sizes from 1 to 5 tons. Details of the type, as well as illustrations, are given herewith of this new product which should interest the automotive industry.

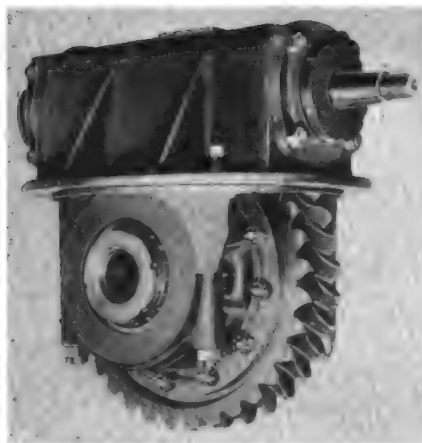
THE manufacture of printing presses is one of the most exacting branches of the machinery industry, calling for great care in design and precision in workmanship. Therefore, the conversion of a shop which has been devoted to that purpose, to the manufacture of truck axles should be a comparatively simple matter. Such a conversion has been made by the John Thompson Press Co., which has begun the manufacture of worm-driven truck axles in sizes from 1 to 5 tons.

The housing for the new axle is a one-piece malleable casting, reinforced with longitudinal ribs placed for maximum strength and minimum weight. Strength tests made with hydraulic pressure are said to have shown that from 60 to 75 tons' pressure is required to spring the two-ton housing $\frac{1}{2}$ in. when supported on the spring pads, the force being applied at the center of the housing.

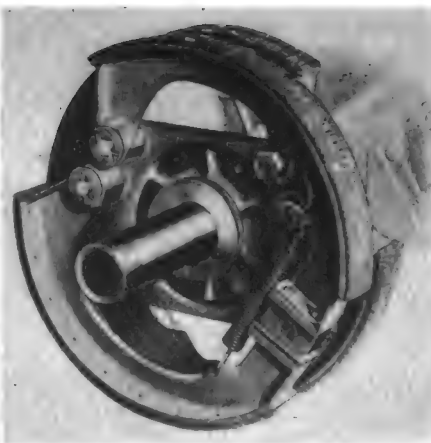
The differential housing is a complete assembly, a self-contained unit carrying the worm, worm gear and differential gears. Ball bearings are used for both worm and differential. The structure is readily removed for examination or change of gears and is attached to the main housing by studs and nuts.

Chrome nickel steel is used for the worm, which is of the straight type, heat treated and ground. The

standard ratio for the one-ton truck is $6\frac{3}{4}:1$, with optional ratios of $7\frac{3}{4}:1$ and $8\frac{3}{4}:1$. For the two-ton trucks the standard ratio is $8\frac{3}{4}:1$, with optional ratios of $7\frac{3}{4}:1$ and $9:1$. For the three-ton type, the standard is $10\frac{1}{3}:1$; optional, $12:1$ or $8\frac{3}{4}:1$. An excellent idea of the assembly can be had from the illustrations. The worm wheel is of a special bronze having a tensile strength of 60,000 lb. per sq. in.



Worm assembly

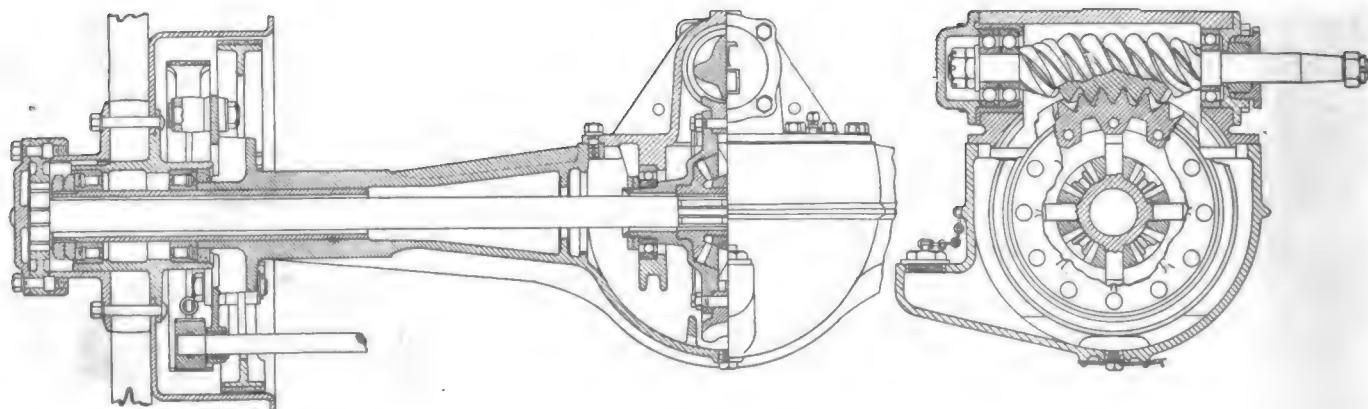


Brake assembly

On the one-ton truck each wheel is mounted on two single row bearings. Each bearing has a radial load capacity of 4900 lb. at 100 r.p.m., making the total load capacity for the four wheels 19,600 lb. On the two-ton truck there are two double row ball bearings, with a combined capacity of 7900 lb., or a total of 31,680 lb. for the four wheels. The $3\frac{1}{2}$ -ton truck has two single row

ball bearings for each wheel. Each front wheel has a bearing capacity of 13,920 lb., and each rear wheel 15,800 lb., giving a total radial load capacity of 59,440 lb. A feature of the wheel mounting is the fact that the outer wheel flange is keyed to the hub, thus reducing strain on bolts.

The drive shaft is a one-piece forging, one end of which is splined to fit into the differential bevel gear. The outer end fits into the driving nut, which is securely bolted to the hub flange. The shaft is full-floating type.



Thompson full-floating truck axle

Foundry Turnover and Production Difficulties Met by Better Conditions

High labor turnover and unsatisfactory production in the foundry are almost universal in the automotive industry. Many executives see the coming summer as a period of crisis in the output of such material. The experience of several firms in successfully meeting the difficulties, given here, points a possible solution of the problem

A CHART compiled recently by the American Malleable Castings Association shows distinctly the difficulties in getting satisfactory foundry production at the present time. The chart indicates that, with the exception of the actual war period, the foundries have been unable to maintain their potential capacity production and that they are operating even farther below that limit than before the war.

Interpreting the results shown by the chart, the association is authority for the statement that foundry capacity is ample to provide for all the known demand, if shop and molding capacity were the only considerations. "The whole trouble," the statement sets forth, "is due to the scarcity of labor. . . ."

This view is borne out by the statement of the purchasing agent of a large Detroit automotive concern. He said: "It is almost impossible to get and hold men for work in the foundry. The older men in the trade are dying off and the young fellows are learning different trades where the work is easier and more pleasant. Next summer looks like a crisis; there seems to be no remedy for the situation."

A review of the labor turnover in automotive foundries reveals an excessive number of "quits," while absenteeism prevails more largely than in any other part of the factory. The experience of one Pennsylvania engine plant during January is typical of automotive plants that operate foundries. This plant employs approximately 1500 men, about

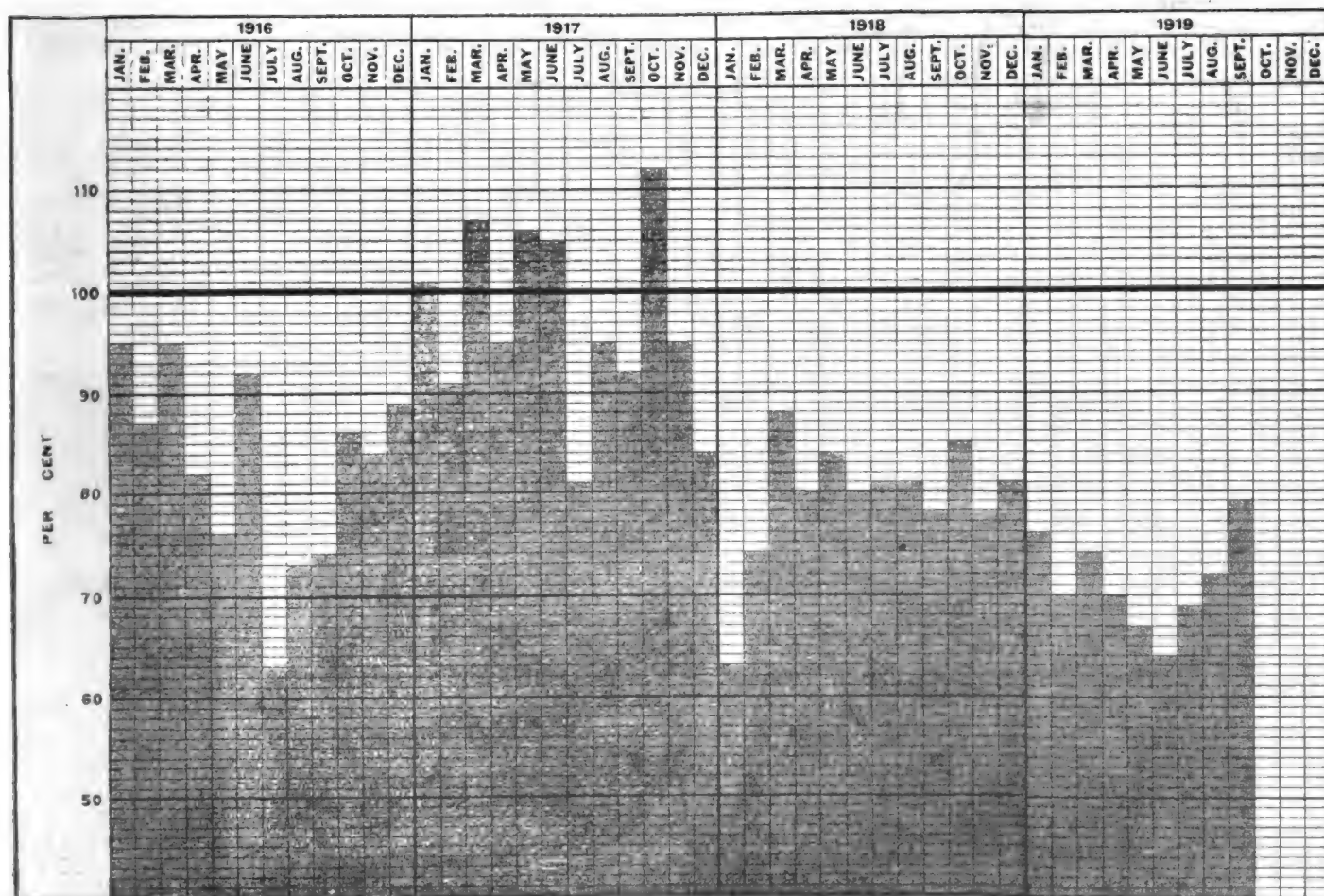


Chart showing shipments of castings by members of the American Malleable Castings Association. The shaded portion indicates shipments by months in relation to capacity

400 of whom constitute the foundry force. The total separations from this plant in January were 172, a turnover of about 12 per cent for the month. Out of this number, however, 86—half of the total separations—occurred from the foundry force. In other words, the foundry turnover was about 21.5 per cent, as against 7.8 per cent for the remainder of the plant. A large Detroit automobile factory recorded a similar experience last year, the average foundry turnover having been double the average plant turnover.

Thus, from the manufacturers' point of view, labor is the vital spot in the problems of foundry production and turnover. That these two factors are not operating in a satisfactory manner is attested by many employment managers and foundry superintendents. The unsatisfactory conditions are making themselves felt in a limited supply of castings and kindred inconveniences, yet definite attempts to investigate and remedy the difficulty are comparatively "few and far between."

The above facts granted, it is necessary to analyze the difficulties in detail to find possible remedies. One general statement may safely be made: Working conditions in the average foundry are far less pleasant and the work is usually more arduous than in any other part of the plant, with the possible exception of the forge shop. This being true, a careful study should indicate the chief causes of these unfavorable conditions, so that many of them may be eliminated. Certain practical experiments, as well as common sense, indicate that labor turnover can be greatly reduced and production effectually increased by making the foundry as pleasant a place in which to work as the machine shop or tool room.

Unfavorable Foundry Conditions

An investigation made several years ago of the factories of New York State revealed some interesting evidence concerning foundry conditions and foundry practices that tend to make the turnover excessive in that portion of the factory.

"In testifying before the New York Factory Investigating Commission, an Irish molder summed up the general conditions in foundries vividly and with characteristic Irish keenness. "The conditions," he said, "in some of the shops is very poor, and in others, not so good." While the statement is not an intellectual analysis of the cause of foundry labor trouble, it does express a reaction on the part of the workman which must be taken definitely into consideration in seeking a solution to the difficulty.

Such a general statement, however, will not suffice. Definite conditions must be studied and definite remedies sought. Some of the chief specific objections to ordinary foundry conditions are included in the following list. Some already have been eliminated in certain plants, but the majority of foundries still contain enough of them to cause a high turnover and a curtailed production.

1. Dust, arising from shaking out castings, mixing up sand, etc., fills the lungs of workers and makes them liable to pulmonary diseases of various kinds.
2. Steam, arising from mold, often obscures light and makes accidents easy.
3. Gases, arising from cores, have ill effect upon lungs, eyes and general health of workers.
4. Chips from chipping castings fly some distance and endanger molders and other workers when this operation is performed in the same room with other portions of the foundry work.
5. The light is obscured and the air defiled by fumes from open wood and charcoal fires.
6. Drafts and poor ventilation in general.

7. Narrow obstructed passageways.

8. Inadequate or unclean toilet facilities.

None of these conditions is, of course, unfamiliar to the foundry owner, but the important relation which they bear to actual production and turnover seem to be less apparent. Were this relationship sufficiently recognized, it is hardly probable that so many of them would still be found in the average foundry. This is particularly true, since there is some remedy for practically every unfavorable foundry condition—not a theoretical, abstract remedy, but a practicable, workable remedy, which has been tried and proved. The Commissioner of the National Association of Founders said to the New York Commission a few years ago:

"I have been devoting considerable time in endeavoring to bring about better working conditions that go far beyond anything suggested in these measures. It is a business proposition, cutting out the philanthropy and all that sort of thing."

The results to the individual workman of bad conditions are, in a general way, such as to hinder the young man of to-day from entering this trade, if he can make good on work of another sort. Industrial insurance mortality statistics, for instance, show an excessive mortality rate from consumption among foundry workers, this becoming marked between the ages of twenty-five and thirty-four. Other personal disadvantages accrue to the foundry worker which he can avoid by working elsewhere and, as a result, many foundry workers are doing just that thing.

The objectionable conditions enumerated do not, of course, cover the whole field, and the suggestion and application of practical remedies is the work of an expert in production and foundry practice. Some plants, however, have eliminated the chief unfavorable conditions in their foundries and have thereby achieved results worthy of notice.

A Practical Example of Improvement

The foundry of the Bullard Machine Tool Co. affords an excellent example of what may be done in a practical way toward bettering conditions and increasing production.

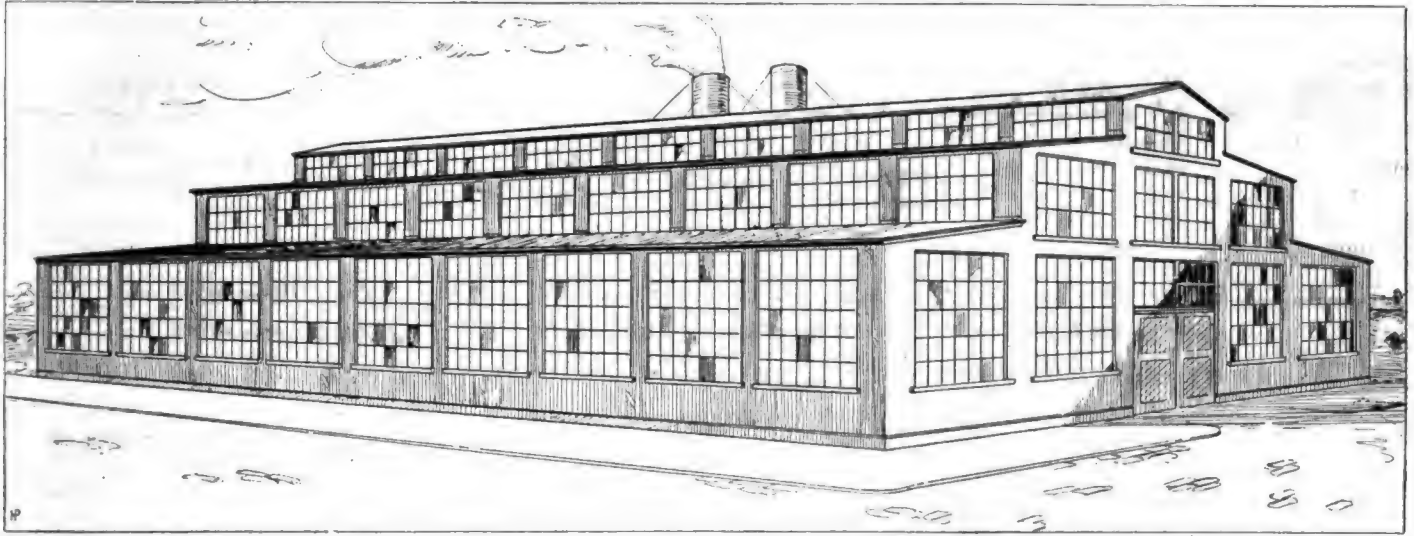
The construction of the foundry building is the greatest asset to improved working conditions. The walls of the structure are chiefly of glass, glazed over with white paint, eight or ten feet from the ground. Thus the interior is well lighted, while the direct sun rays are broken.

The type of roof construction not only aids in lighting, but admits of excellent ventilation without either causing drafts or making forced ventilation of any kind necessary. The windows at the side can be opened in sections, as can those at the top of the building. This natural ventilation is regulated in such a way that smoke and gases are almost immediately carried off, leaving the air for breathing clean and fresh.

Even in the afternoon, when most of the molds are poured, the air is clear and pleasant to breathe. Moreover, the ventilation is so good and the light so ample that it is possible to see clearly from end to end of the building at any time of the day.

The work of sand-blasting and chipping castings is carried on in a separate building adjacent to the main foundry, thus eliminating from the foundry proper one source of excessive dust and dirt. The sand-blast machine is operated in an enclosed booth, the operator entering the booth with his goggles, helmet, etc., and cleaning the castings. The sand is confined in the compartment and does not circulate about the rest of the shop.

All heavy work of any kind is handled in the foundry proper by means of cranes, so that a minimum of labor



Type of foundry building in use at Bullard Machine Tool Co. Natural light and ventilation are obtained to the fullest extent. High production per man has been obtained

is necessary. Ample space for moving about is provided, with the result that the accident record is lower than the average.

Clean toilets and washing facilities, as well as shower baths, are provided for the men. The cleanliness of the toilet facilities make them attractive. The wash basins are more popular than the shower baths and a greater number are provided. This is likely to be true in most foundries, as a man will be desirous of getting home as soon after his work as possible.

Each worker is provided with an individual locker and most of the men change their clothes before leaving.

Adjacent to the main foundry building is a smaller section in which small castings are made by means of greensand molding. Originally constructed for a machine shop, the building has a much lower roof than the main foundry. It is an excellent example of what can be done, however, in adapting a building to foundry purposes. One large fan at the end of the room operates a number of forced drafts that quickly carry off the gases as they arise from the cores and molds. The atmosphere is thus kept nearly as clean and clear as in the main building.

Possibilities of a New Foundry

The Lycoming Foundry & Machinery Co. is another firm which has caught a practical vision of the production possibilities of a well-equipped foundry. The equipment includes clean toilet facilities and individual lockers, as well as comparatively good lighting facilities for the work. A new foundry is to be built, however, that will comprise both modern high-speed production methods and up-to-date building construction and working conditions.

One of the distinctive features of the new foundry will be a separate room for the cooling of cores. It will be effectually separated from the rest of the foundry and will be equipped with a special ventilation system for carrying off the gases.

This device will eliminate a particularly unpleasant condition of the ordinary foundry. Since this plant produces only engine parts, the new plant will be put on a production basis, conveyors, etc., eliminating practically all hand work.

The building planned for the new foundry will be somewhat similar to that of the Bullard plant, embodying the features for light and ventilation already described.

The foundry turnover at Bullard is estimated at something like 10 per cent monthly, which is exceptionally low

when compared to that of the average foundry—particularly those of the automotive industry. This turnover is occurring almost entirely among the common labor; for molders and core-makers it averages less than 4 per cent. In addition to this comparatively low turnover, production has progressed exceptionally well. It is estimated that the average foundry is able to produce between 800 and 960 lb. of castings per molder, per week. The Bullard foundry recently reached a peak of 1560 lb. per molder, per week, while the production during the past year has varied between 1100 and 1500 lb.

There are other firms which have found it practicable to make their foundries as congenial a working place as any other portion of the factory. Their success in reducing turnover is especially significant at a time when the manufacturer is casting about for means of increasing his output and stabilizing his working force. A study of conditions and possible remedies may reveal possibilities for improvement, even where a new modern building might seem, at first glance, to be the only solution of the problems involved.

In making its recommendations, the New York Committee wrote: "All reasonable measures calculated to promote greater safety and health for employees in foundries should not only be insisted upon by the State, but should be welcomed by the foundry owners themselves."

In many States the laws regarding foundries, if lived up to in every particular by the manufacturer, would increase production for him; yet it is an unfortunate fact that such laws are too frequently disregarded or loosely enforced.

Girls Successful Crane Operators

WOMEN have been found superior to men as operators of inside shop cranes in the experience of the Bullard Machine Tool Company. Girls were first employed on this job during war times and their services were satisfactory. After the signing of the armistice, however, the girls were replaced by men.

In a short time, the workmen who loaded and unloaded the cranes protested, stating that the girls were far more accurate in stopping the cranes at the proper place and in lowering the materials accurately. They even threatened to quit work if the girls were not again placed on the cranes. Consequently, the girls were employed again and are now operating the cranes.

Glass Makers See Shortage Continued Until Next Year

Few phases of automotive production are of more import today than that concerning materials. Consequently, the statement and comment herewith were obtained by this publication so that the industry might have a concrete prediction as to the future course of the supply. Glass is an important material and its lack has hampered a large measure of output.

AN ample supply of glass for use in the building of closed bodies for the automotive trade probably will not be available until the early part of next year. A statement to this effect has been made to AUTOMOTIVE INDUSTRIES by Charles W. Brown, the president of the Pittsburgh Plate Glass Co. As this company manufactures approximately 60 per cent of the supply, the statement which follows is of unusual interest at this time, as it sets forth what may be expected in this phase of the materials market.

"In the spring of 1919 it was generally supposed that we were approaching an era of declining prices in the glass industry. Jobbers, mirror manufacturers, and, to some extent, the buyers of glass for automobiles, all felt that a reduction in price was likely and the manufacturers, finding it very difficult to sell their product, generally curtailed production rather than to put glass in stock on a basis of what seemed to be a high cost. Accordingly, manufacturers, jobbers and users of glass reduced their stocks to a minimum.

"Early last summer a decided change occurred. Apparently the trend of wages and costs was upward and a very unusual demand developed for automobiles, particularly for closed bodies. The furniture business was exceedingly good, and quite a demand developed for glass for mirror purposes.

"It was evident for the last six months of 1919 and the first part of 1920 that the demand for plate glass for automobile purposes was going to be much larger than ever before.

"Recognizing the situation, our company is now expending between \$8,000,000 and \$10,000,000 to increase the production of plate glass, but it will take some time to erect factories and perfect an organization. However, unless something unusual occurs, the plate glass manufacturers expect to be able to supply the demand for automobile purposes by the first part of next year. Many of the other manufacturers are also increasing their capacity materially.

"Incidentally, I might say that this is practically the first time for thirty years that the demand for plate glass has exceeded the supply and this condition is only temporary.

"Obviously, you are familiar with the interruptions of production of plate glass on account of the coal strike and difficulties in securing labor and transportation, all of which have had some effect on decreasing the supply of plate glass."

Furthering this statement, so far as it reveals the ex-

tent of the present shortage, was the recent announcement by one of the large commercial agencies in its weekly report that several established lines of furniture were being eliminated, at least for the time being, because the automobile body builders had outbid the furniture men for the glass they needed. Therein is given a graphic illustration of the glass situation.

The shortage of glass for closed body construction became known to the trade at large during the coal strike, when body-building plants were forced to close because of a shortage of glass. This was the first serious weakness to develop in the materials market.

The situation, however, was not a surprise for the larger companies. They knew that the crash was coming. As evidence of this knowledge can be cited large display advertisements run in British newspapers early last fall, seeking stocks of glass for export to America. One British representative of an American automobile company spent more than \$2000 in such advertising. The only response he received was inquiries for any material he might uncover in addition to his own needs, and he did not obtain any glass for shipment out of England.

Since that time some of the larger body companies have fortified themselves for the future by buying glass plants. This step is regarded with favor by the smaller concerns. One of these builders said to AUTOMOTIVE INDUSTRIES: "I think this will help us. General Motors, for instance, probably will develop this source of supply sufficiently to care for their needs and leave the Pittsburgh supply for the rest of us."

ANNOUNCED from New York that the American Manufacturers' Association has adopted resolutions warning members against impending trade relations with Russia under the Soviet Government. The resolutions emphasize that direct trade with Russia would be virtually impossible except under supervision and control of the Soviet Government, and in any event would be small in volume, due to the demoralization of the Russian transportation system and the fact that business transactions for some time must be on a barter basis.

THE Canadian Bureau of Statistics has issued in detail a final estimate of the yield and value of the principal field crops of Canada for the season of 1919, as compared with 1918. The total yield of wheat from all Canada in 1919 was returned as 193,260,400 bushels from 19,125,968 sown acres, an average yield of better than 10 bushels per acre.

Improved Method of Machining Pistons Lowers Costs

By the method outlined here it is endeavored to obtain a product of the highest grade at low labor cost. Particular attention is given to simplicity of tooling, and the performance of work automatically whenever possible.

THE subject of machining pistons is important, both from engineering and economic considerations, and hence the attempts at improving the methods. In the present process each operation is described separately.

First Operation.—The casting as it comes from the foundry is set over a centering mandrel in the sensitive drill press and center-drilled true with the rough core, the drill being guided by a bushing. There is no need of finishing the skirt or open end at this time, as the work would only have to be done over again after the piece is roughed out, owing to the distortion in "seasoning." The piston can be held successfully for rough turning true with the core without holding by the skirt.

The piston should be provided with a large boss so that a deep, heavy center can be used. It is the plan to take heavy cuts and a small center hole will not do.

Second Operation.—The piston is mounted on the expanding and centering air-operated mandrel in the Fay automatic lathe as shown in Fig. 1, the outer end being held in place by air-operated tailstock shown in Fig. 2.

In Fig. 1 the three plungers A center the open end with the core, while the closed end is centered by the dead

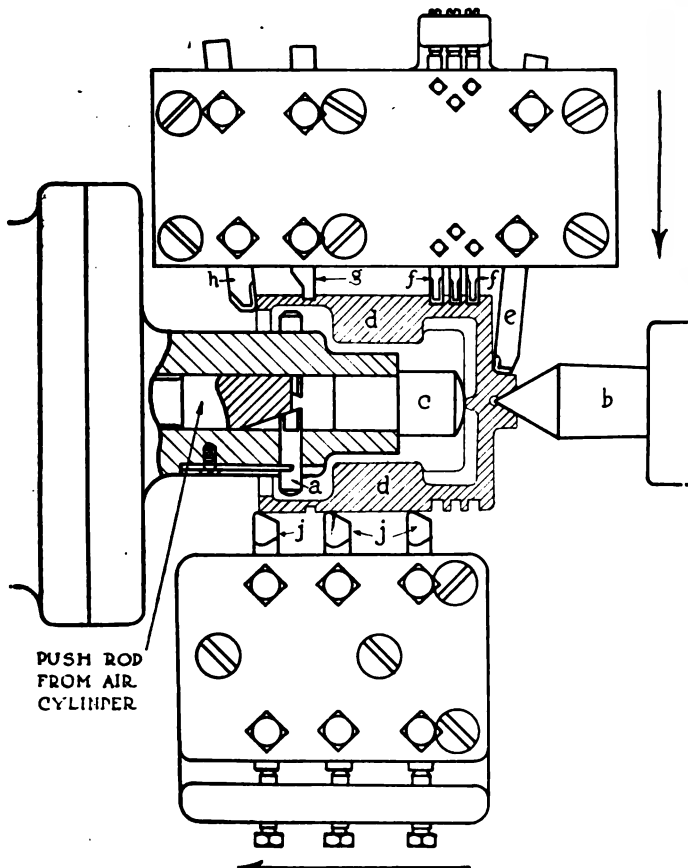


Fig. 1—Piston mounted on expanding and centering mandrel of Fay lathe

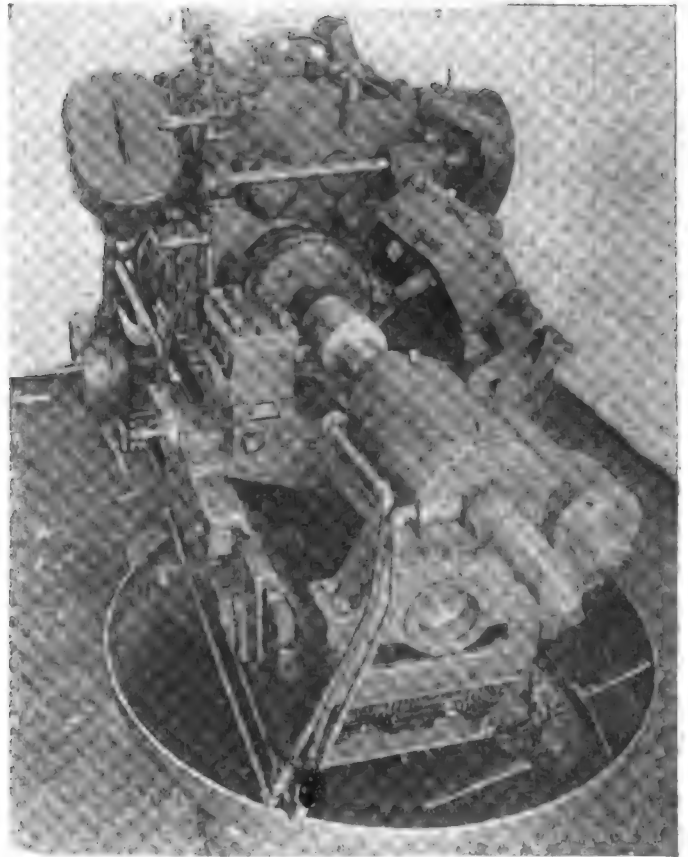


Fig. 2—Outer end of piston held by air-operated tailstock of Fay lathe

center B, drilled true in the first operation. The inner end of the core stops against plug C, giving a uniform thickness of wall to the piston head. Driver D engages the wrist pin lugs and gives a positive drive. The piston is thus centered on the core, strongly supported and driven by a fast operating air mechanism.

The rear tool-holder feeds in radially and carries facing tool E, rough ring-grooving tools F and oil-groove tool G. Tool H faces the open end. The front carriage carries the three turning tools J which feed into depth on an angle, as shown by the arrow, and divide the rough turning between them.

As many tools J are used as are needed to complete the turning in the time it takes tool E to face the end. In other words, the piston is completely roughed out over its entire exterior surface in the time it takes to face the end.

Third Operation.—The piston should now have the wrist pin holes drilled (rough) in a jig which centers on the rough turned exterior, stops against the rough-faced end, and lines up by the bosses on the inside. This operation completes the removal of the bulk of the material.

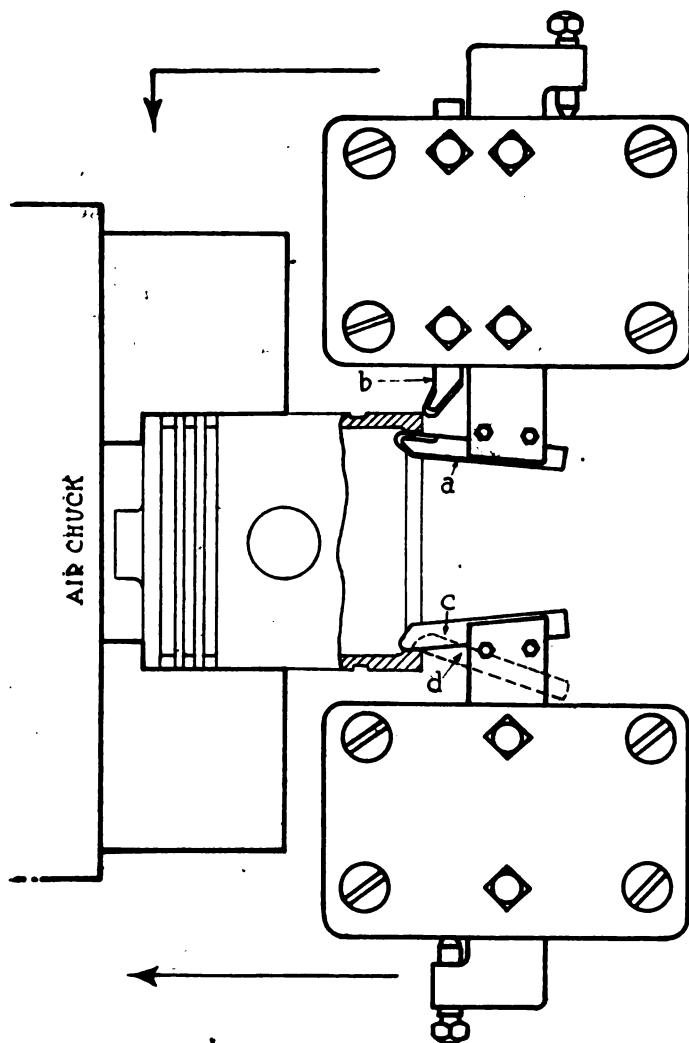


Fig. 3—Jones & Lamson method of finishing skirt end of piston

Fourth Operation.—This is the logical time to anneal. With the scale and surplus material removed, it is possible to eliminate all strains and every chance of future distortion. It is objectionable to remove the pistons from the machine room to an outside heat-treating shop, but this may not be necessary. A modern, continuous feeding automatic furnace can be installed in the shop, right in the production line. Suitable heat insulation and forced ventilation will make the arrangement comfortable even in hot weather.

Fifth Operation.—This is the logical time at which to finish-face and bore the skirt or open end. With strains removed and stock roughed off there is no danger of further distortion. This skirt finishing is done in an air chuck on the Fay automatic lathe as shown in Fig. 3. The back arm moves in the direction shown by the arrow, so that tool A first rough-bores, then tool B finish-faces. The rough-facing was done by tool H in Fig. 1. The front carriage carries only the finish-boring tool C, unless it is desired to break or bevel the corner, in which case a tool D shown in dotted lines is added for the purpose. At the conclusion of the cut the tools, both front and back, withdraw, without scoring the work, to a point which leaves plenty of room to remove the work.

In this operation the work is held by the outside diameter and stopped on the face of the closed end. Since these surfaces were made true and of even dimensions with the core in Fig. 1, the finish-bored skirt will also be true and of the proper dimensions with the core, and may therefore be used from now on for locating the piston. Being held

with the skirt projecting well beyond the jaws, there is no distortion from the chucking.

Sixth Operation.—Finish-turning complete comes next. The piston is now seated on a hardened and ground plate on the spindle of the lathe, and held there by a floating center in the quick-acting air tailstock. This center has a ball thrust, and is made floating to obviate the necessity for recentring true with the skirt. The method has been found to be as accurate as holding by draw-rod and loose wrist pin, it avoids the loose piece, and it is much more rapid in operation. The drive is by the equalizing driver D, engaging the wrist pin lugs.

In this operation there are three tool holders, as shown in Fig. 4. The front and back holders are tooled about the same as in Fig. 1. There is an additional grooving attachment carrying tools for grooving the rings. This attachment is strongly supported on the tailstock casting and is operated by the forward movement of the carriage.

In the grooving attachment, tool H give a second roughing cut to the piston grooves. In the rear holder, tool A finish-faces the end of the piston and tools B finish the ring grooves. In the front carriage, tools C, three of them, finish-turn ready for final grinding. With this arrangement the ring grooves are given three cuts in all, permitting great accuracy in the finish surfaces.

The finish turning, grooving and facing operations are completed simultaneously with the end facing operation. Finally, the ring grooves are finished on centers, eliminating all end play of the spindle. This makes it unnecessary to go to the engine lathe for a final grooving operation.

The piston next has the wrist pin holes finished and then goes to the drill press for miscellaneous drilling of oil holes, etc. The center boss is next sawed off in the hand mill, and finished off on a disk grinder. Some firms remove it entirely by disk grinding. It is now ready for the final grinding, which is done on a face plate, holding by the draw-rod and a loose wrist-pin.

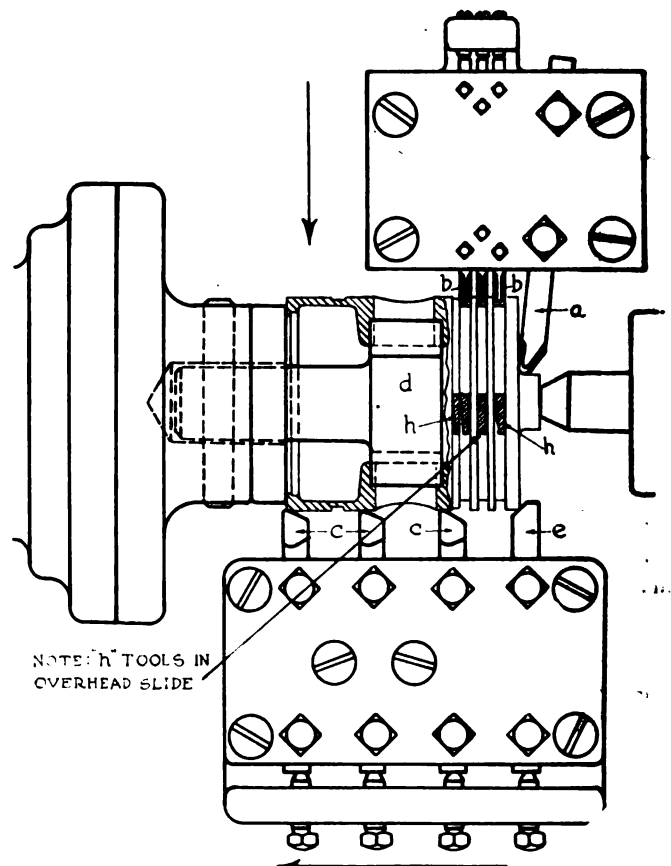


Fig. 4—Finish-turning, grooving and facing a piston in a Fay lathe

The short bed or "ring bevel gear" Fay automatic lathe used for operations 2, 5 and 6 is standard, except that the automatic speed change has been eliminated in each case. A ball thrust is used on the spindle to take the pressure of the air tailstock. The machine is started by the operator and stops itself with a quick active brake on the conclusion of the cut. It is adapted to direct motor drive.

In the first operation an air tailstock and an air mandrel are required in addition to the special tool holders. In the fifth operation an air chuck is required. The sixth operation requires face plate fixtures, air tailstock and special grooving attachment. Reducing valves must be used to limit the pressure on the air tailstock.

For less accurate work the operations can be somewhat simplified and made a trifle more rapid.

A Screw Tap with Shearing Cutting Edge

A RECENT improvement in taps consists in grinding at an angle the cutting edges at the point of the tap. It is held that this gives substantially the same cutting action as that obtained with lawn mower blades, with scissors or with a razor when drawn across the face at an angle. Referring to Fig. 1, cutting edges A at the point of the tap are ground at an angle B to the axis for a distance of three or four threads. This angle, in conjunction with the hook of the land and special flute form,

first few teeth, the rest of the thread, acting as a lead screw, steadying the tap and producing accurate work.

The angular cutting edge, with its pronounced hook, shears the metal instead of tearing it off. It is claimed that owing to this shearing action but half the usual power is required and a much cleaner thread is cut in any material. As the grinding is done only on the cutting edges, the tap will cut to size until ground down to the last three or four teeth.

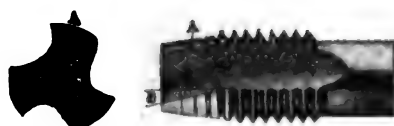


Fig. 1—Cutting edges A are ground at an angle B



Fig. 2—A long curling chip is produced



Fig. 3—Tap made by Greenfield Tap & Die Co.

produces a long curling chip, Fig. 2, similar to that of a well-ground lathe tool. This chip is not passed out through the flute as in the ordinary tap, but shoots out ahead of the tool. Hence the name "gun tap" has been given to the tool, which is shown complete in Fig. 3.

The flutes are not needed for the passage of chips and therefore are made comparatively shallow, leaving a very large cross-sectional area. In fact, there is as much metal in the threaded section as in the shank, and this makes for unusual strength. All of the cutting is done by the

The "gun tap" is said to be specially adapted to the quantity production of accurately tapped holes. Inasmuch as the chips shoot ahead of the tap, it is imperative in blind hole work to provide sufficient bottom clearance, as otherwise the chips jam into the end of the hole and stop the tap with disastrous results. A good general rule for blind hole tapping is to make the clearance equal to one-quarter the depth of the hole. While this necessitates a little extra work for the drill, it is said to be more than compensated for by the increased speed and accuracy.

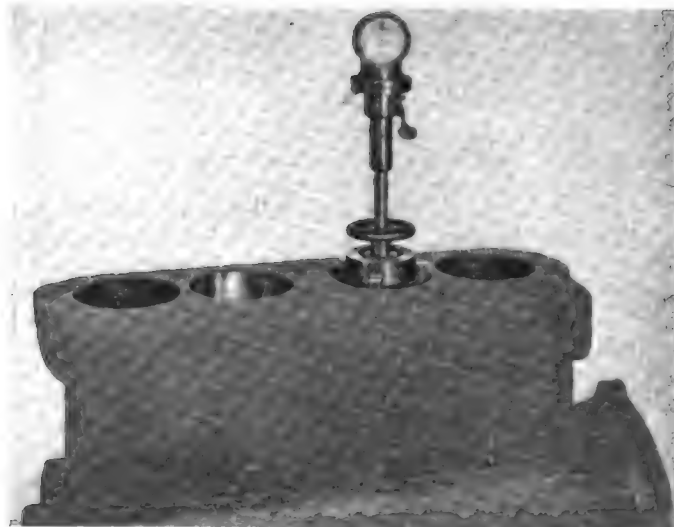
Improved Cylinder Gage

FOR determining variations in the size of cylinder bores there has been developed a test gage which has the advantage that while the feelers are inside the cylinders the dial indicating the variations is outside and in plain sight. The radial feelers bear against a conical cam, being pressed against the latter by means of suitable springs. This cam is connected to a steel rod, running through an outer casing to a rack and spur movement which operates the dial. By means of a lever connected to the steel rod the cam is lowered, thus permitting the feelers to recede sufficiently for insertion. Once inside the bore, the feelers are released against the inner sides of the cylinder by means of the lever. The manufacturers of this interesting device are the Federal Products Corp.

A centralizing support holds the apparatus in position. It is placed at the mouth of the cylinder, and has three fingers which bind firmly against the walls of the cylinder and which are operated by a hand wheel in connection with a scroll and rack movement. The gage body turns freely and slides in and out through the centralizing support. The dial, which is graduated in thousandths of an inch, can also be turned to any desired position on the axis of the hand wheel.

In practice, the feelers, before insertion in the cylinder, are set to a master gager, while at the same time the face of the dial is turned until the hand points to zero. Then,

when the feelers are moved about in the cylinder, all variations from the correct dimensions are indicated by a movement of the dial hand to either side of the zero point.



Cylinder gage of Federal Products Corporation

A Study of the Methods and Operations of Japanning Practice

Part II

This article concludes the detailed report on japanning processes begun by Mr. Darrah in last week's issue. He describes the equipment necessary for the storage, handling, conveying, cleaning and baking departments. The discussion should prove of interest to all production engineers.

By W. A. Darrah *

THE japanning plant includes the following essential equipment:

- Japan storage equipment.
- Japan handling equipment.
- Mechanical conveyor.
- Cleaning and baking equipment.

The equipment involved in the storage and handling of the liquid japan has been dealt with briefly in the earlier portion of this paper.

The mechanical conveyor may take many different forms, depending upon the nature of the material to be handled and the desired method of treatment. Each individual plant requires a study of many local factors before a sound recommendation can be made as to type and general characteristics of the conveyor. It is needless to say that the simplest possible type of equipment should be employed and a special effort should be made to avoid both special designs and complicated mechanism. The fact should be kept constantly in mind that difficulty with the conveyor system will completely tie up the plant until it is corrected, involving therefore not only a loss of production and time but possibly causing a large amount of defective work.

With this in view, the conveyor should be provided with ample factors of safety in all parts and present operating practice should be freely considered. The relatively high operating temperatures to which some portions of the conveyor are continuously subjected should be kept in mind from the standpoints of lubrication, wear and strength. At temperatures in the neighborhood of 450 deg. F. most oils are valueless and babbitt or composition bearings are objectionable. Graphite may be used to some extent as a lubricant in these cases.

In passing, it may be of interest to note that the light from the mercury arc lamp has been found to be peculiarly suited for inspection of japanned surfaces. Experience indicates that the monochromatic nature of the light from this source allows the ready detection of cracks and imperfections.

The japanning oven is one of the most important parts of the plant equipment, since on the proper operation of this apparatus depends the uniformity and quality of the output. While there are many conflicting requirements incidental to the successful operation of japanning ovens,

a few of the fundamental considerations are summarized below:

Safety.	Economy.
Reliability.	Cleanliness.
Controllability.	Production.

There are two fundamentally different mechanical arrangements employed in the construction of japanning ovens, although both types consist of merely a large (usually metal) box, surrounded by from 3 to 6 in. of heat-insulation. Nonpareil or silocel insulation is excellent for this purpose.

In the case of the earlier or batch type of oven, the material to be japanned is placed in the oven, the doors closed, and the temperature raised to the desired point. The heating is continued for the necessary length of time and usually some means of ventilation is employed. The batch type of oven, when properly operated, will produce excellent results, and is particularly adapted for small plants. Automobile factories producing not more than 100 cars per day can obtain excellent results with this type, although it will be evident that continual supervision by skilled and responsible help is necessary since not only must temperatures and time be controlled, but the rate of temperature changes must be carefully watched. The fuel economy in the case of the batch oven is usually much lower than in the case of the continuous oven and the labor charges are much higher. The production per given investment also is lower with the batch oven.

The continuous japanning oven differs from the batch oven only in that it is a long heat-insulated box, usually open at both ends and equipped with conveying means for continuously carrying the material to be treated through the oven. In all plants having a production materially in excess of 100 cars per day the continuous oven is preferable.

Continuous ovens are constructed in many varying designs, some typical installations being shown in the cuts herewith. For treating automobile bodies (in those cases which are now becoming relatively numerous, in which there are no wooden parts built into the metal body), it is usual practice to employ an oven about 140 ft. long, 5 ft. wide and 6 ft. high. The ovens are usually entirely horizontal in this case but are frequently provided with vestibules that serve to reduce the circulation of cold air from without, thus keeping the temperature within the oven higher and more uniform. In the case of body ovens, two parallel horizontal chains are used for conveyors, the

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As will be noted from the cuts there are two typical methods of reducing the leakage of hot air from the oven and the consequent entrance of cold air. Both methods depend upon the lower specific gravity of warm air which causes it to rise. In the one case the oven is located on the roof, while the material to be japanned enters at one of the lower floors, passing up an incline before it reaches the hottest portion of the oven. Another method of obtaining substantially the same result, but modified to deliver the finished product nearer the point of which it enters, is shown in the case of the double deck fender oven illustrated herewith.

The image contains several technical drawings of an enameling oven system:

- END ELEVATION**: Shows the front view of the oven with electric heaters and structural supports.
- SIDE ELEVATION**: Shows the side profile of the oven with various dimensions and labels for different sections.
- General Layout (Top)**: A plan view showing the overall dimensions and sequence of operations: LOAD, PRE HEAT-15 MIN, WIPE, DIP, RUBBER COAT, Drip, BAKE 30 MIN., and UNLOAD. It includes temperature ranges (450 TO 500°F) and chain speed (20 INCHES PER MIN).
- 1st COAT ENAMEL**: A detailed view of the first enamel coating section, showing dimensions and temperature (450 TO 500°F).
- 2ND COAT ENAMEL**: A detailed view of the second enamel coating section, showing dimensions and temperature (450 TO 500°F).
- Unloading Section**: A detailed view of the unloading area, showing dimensions and a heating unit.
- Enamel Oven**: A detailed view of the enamel oven section, showing dimensions and temperature (450 TO 500°F).
- Rubber Coat Oven**: A detailed view of the rubber coat oven section, showing dimensions and temperature (450 TO 500°F).
- Section A-A**: A cross-sectional view of the oven structure, showing dimensions and a heating unit.

Enameling ovens. The upper view shows a general layout while below it are shown the details

The objections to such a system are obvious. The temperatures are not subject to accurate control, the temperature of the ovens is not uniform throughout, the dangers of fire from an open flame are excessive, the products of combustion passing through the oven frequently contain traces of soot and always large amounts of water vapor. As a result of these conditions the quality of the work produced by an oven of this type is not as satisfactory as that of later types, and with the present price of gas the operating costs are high. Careful supervision is necessary.

Electric Ovens

The electrically-heated oven has been widely introduced and is in successful use at a large number of plants. Electric heat allows simple and accurate control, permits a relatively uniform temperature throughout the oven, and is free from the objections of soot and water vapor inherent in the gas-fired oven. The most serious objection to the electrically-heated oven is the extremely high cost of this form of heat. A consideration of the fact that even large power users cannot as a rule secure a lower rate for japanning equipment than from 1 to 1½ cents per kilowatt hour will make evident the very high costs involved. For example, one large automobile manufacturer producing approximately 1000 cars per day has a power bill for japanning ovens alone of about \$1,500 per day. For purposes of comparison, it may be stated that the same service secured from japanning ovens heated by the combustion of fuel oil would cost not over \$400 per day, giving a yearly saving of over \$300,000. The combustion system referred to above will be referred to later in this report. It should be noted that while the electrically-heated oven can be easily controlled and is normally very reliable, yet in this case the manufacturer is dependent upon power service, and in case of any interruption of the central station service his ovens are closed down, thus stopping all production and possibly causing a material loss of product.

The third and more modern system of applying heat to japanning ovens, consists of the so-called "air-heated type," in which the ventilating air and radiant heating flues are both maintained at the desired temperature by the combustion of fuel oil or gas in a small separate oven.

A typical schematic outline of this system is shown on the opposite page. It will be noted that a small separate oven composed of refractories serves as a fire box or combustion chamber in which the fuel is burned. Mounted above this are a series of air heaters which are divided into three groups. The first and smallest group is employed to supply preheated air for the combustion of the fuel in the heating oven. The second and largest group is used to heat a volume of circulating air which passes through flues arranged longitudinally along the sides of the oven and out, returning through a blower to the heaters. This volume of air serves to transfer heat which is produced at high temperatures in the combustion oven to the material to be japanned where the temperatures are relatively much lower. One large installation of this kind, which may be considered as typical, has been designed on the basis of 650 deg. F. for the temperature of the air entering the radiating flues and 450 deg. F. for the air when leaving the radiating flues. The third set of heaters employed in this system are used to preheat the air used for ventilating purposes, thereby overcoming one of the serious difficulties with the earlier type of electrically-heated oven, namely, lack of uniform temperature throughout the different portions of the oven.

This system may be modified in such a manner that one blower and one set of air heaters is sufficient.

It will be noted that this latter air-heated type of japan-

ning oven permits of securing all of the advantages of the other types of ovens, with the additional advantages of economy, reliability and controllability. It will be apparent that by the use of large radiating flues, which cover substantially the entire side walls of the oven and which are maintained at temperatures about 200 deg. higher than that of the oven, a large amount of radiant heat is applied to the material to be japanned, with the resultant advantages which have been outlined in the earlier portion of this report.

On the other hand, the preheating of the circulating air insures that a large amount of warm entering air will be at all times passing through all portions of the oven, thus eliminating the "cold pockets" which are a troublesome feature of the electrically-heated oven. This forced circulation of warm gases also prevents the accumulation of the relatively heavy volatile products formed during the drying of the japan. The fact that the pressure within the japanning oven by this system is somewhat greater than the external atmospheric pressure (although only a small fraction of an ounce) overcomes the difficulty which is sometimes acute in the electrically-heated oven resulting from the flowing in of cold air in the horizontal type of oven, owing to the draft induced by the exit of the circulating air, or by the difference in weight of the cold and warm air.

On the present basis of fuel oil, at approximately 4 cents a gallon, it has been found that an oil consumption not over 50 gallons per hour will entirely supply heat to a continuous body japanning oven 140 ft. long and having an output of at least 12 automobile bodies per hour. This results in an actual operating saving equal to nearly two-thirds of the cost of power for an electrically heated oven.

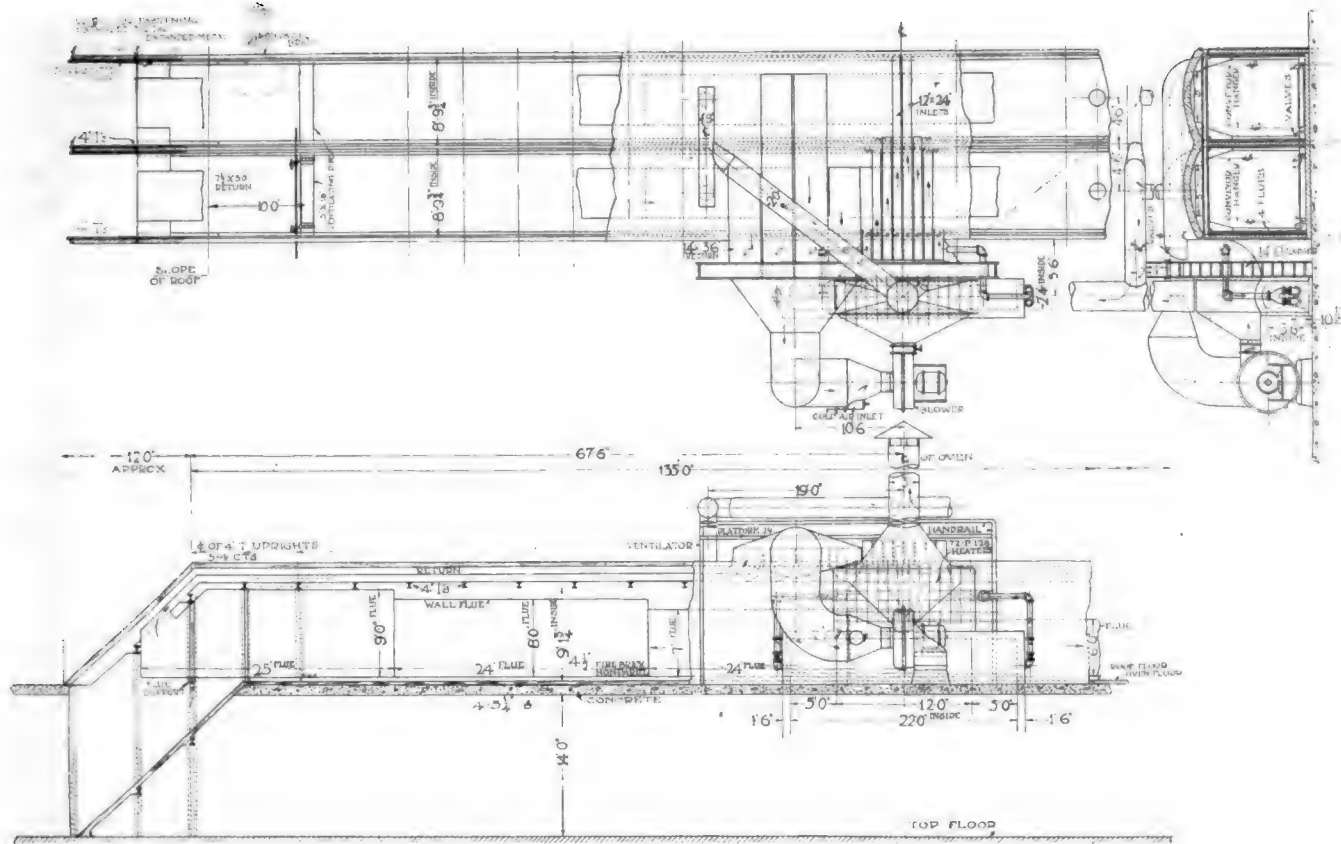
In the case of the air-heated oven described above, it will be noted that none of the products of combustion enter the oven and therefore the difficulties inherent in the earlier types of gas-heated ovens are avoided. Obviously, no soot or water vapor is carried into the oven from the heating chamber.

Temperature Control

In order to continuously produce work of a high quality, absolute control of the temperature throughout the japanning oven is essential. From the foregoing discussion on the properties and characteristics of japan, it will be evident that if the time during which the bodies are submitted to the baking temperature is kept constant the temperature must also be maintained constant or the japan will be either under-dried or over-baked.

Commercial practice has finally reduced successful temperature control to the basis of a pyrometer either operated by a thermo couple or a variable resistance. In either case the change in electric current caused by the change in oven temperature operates a meter which is connected to a relay. The relay is used to close a power circuit controlling an electrically-operated switch in the case of an electrically-heated oven, or an electrically-operated oil and air valve in the case of the air-heated oven. The quickness of response to slight temperature variations is substantially the same in both cases.

In the case of a long oven (75 to 150 ft.) it is usually good practice to divide the temperature control of the oven into two or more sections, each of which may be controlled individually. It is not uncommon in the case of an oven 135 ft. long to place four thermo couples in the roof along the center line of the oven, and approximately equally spaced. In this case the four sections of the oven would be controlled individually and automatically. It is also common practice to provide manual control in addition to automatic control, in order that the temperature of the oven as a whole may be varied when necessary. The neces-



The general arrangement of a body oven

sity for such variation has resulted quite largely from the use of natural draft, and the consequent variation of oven temperature variation is materially less in the case of those ovens in which the ventilating air is preheated and supplied under slight pressure, so that oven conditions and air circulation are independent of weather variations.

It has been previously pointed out that essentially the japanning oven consists of an insulated box provided with heating means and conveyor equipment. There are naturally many different mechanical constructions in use, many of which give satisfactory results.

From the standpoint of heat insulation it is good practice to have the walls at least $4\frac{1}{2}$ in. in thickness, and in case electric power is used for heating, a materially greater thickness is warranted because of the very material economy obtained in operation. Obviously a thinner wall is allowable in the oil-heated oven and the initial cost is therefore much less.

It is desirable, in designing the oven, to have a minimum of external exposed radiating surface per unit volume of useful oven space. In other words, when possible, two or more ovens should be grouped together, thus reducing radiating losses. In connection with the location of ovens, it may be pertinent to suggest that in many cases they may be placed on the roof, thus economizing floor space which may be applied to other purposes. Some of the types of ovens illustrated herewith are particularly applicable to this arrangement.

In constructing a japanning oven it is essential that the walls be air-tight in order that there may be no leakage of gases either into or out of the oven, other than as provided by the ventilating equipment. The oven structure should be as light as possible consistent with mechanical strength.

In designing an oven structure consideration must be given to the fact that in a length of 100 ft. to 150 ft. the total expansion resulting from a temperature change of

about 400 deg. may be several inches, and proper provision must be made for this factor. Particularly in case ventilating and heating flues are introduced, and designed to operate at higher temperatures than the balance of the oven, the factor of thermal expansion must be considered.

Much stress has been laid upon the desirability of avoiding all so-called "through metal" in oven construction. Undoubtedly all metal which extends from the inside of the oven to the exterior serves as a source of loss by heat conduction, but it is the writer's opinion that in many cases this factor has been unduly emphasized, for trade reasons, and possibly with a sacrifice of other advantages.

In the foregoing report the writer has endeavored to briefly outline some of the fundamental considerations connected with modern japanning practice. The art of japanning, like any other modern industry, is subject to many variable conditions, depending upon materials used, results desired, and many other factors.

It is the writer's feeling, that in this industry, as in most cases, it is dangerous to assume a dogmatic position and claim that all who differ are wrong. Without doubt, many of the practices which have been recommended may well be modified to suit special local conditions, while on the other hand there may very possibly be instances in which practices which do not appear to be desirable may be employed to advantage. It is sincerely hoped that this investigation may lead to the development of the japanning industry, and to the consideration of the engineering details involved from a scientific standpoint rather than by the "rule of thumb" method.

ACCORDING to an item in an English newspaper Ernest Bury of the Skinningrove Iron Works has succeeded in extracting alcohol from coke-oven gas on a commercial scale. The report declares that if the process were applied to all of the coal carbonized in Great Britain it would yield 50,000,000 gal. of fuel alcohol yearly.

The Use of the Hollow Strut on the New Airplanes

An analysis carried out to determine the possible saving in weight as compared with solid struts—Hollow struts of different proportions and of wood and steel respectively are considered in detail in this article

By Edward P. Warner*

THERE has been a trend recently toward the use of hollow wooden struts, built up from several pieces of spruce, on airplanes. That this leads to a saving of weight there can, of course, be no question. Interplane struts are long members subjected to direct compression, and the superior weight-strength efficiency of a tube, as compared with a solid rod, under such a loading, is too well known to need remark. The interplane struts, however, are exposed to the wind, and it is accordingly necessary to keep the parasite resistance, as well as the weight, to the lowest possible figure.

The relative importance of reducing the weight and the resistance can best be studied by the use of the concept of "equivalent weight," first employed in the report of the British Advisory Committee for Aeronautics for 1911-12. If the weight of a strut, or of any other part of an airplane, is increased, the machine must either fly faster or increase its angle of incidence in order to secure sustentation. If the speed changes while the angle of incidence remains constant the ratio of lift to drag will remain constant, and the propeller thrust will have to be increased by an amount equal to the added weight divided by the lift-drag ratio. If, on the other hand, the angle of incidence changes, the lift-drag ratio will change, and it is not possible to say at once what total effect the change will have on resistance. The maximum lift-drag ratio for complete airplanes is usually found at an angle between 6 and 8 deg., and small changes of the incidence in the neighborhood of this angle will accordingly have very little effect on the lift-drag ratio. For angles smaller than these, the L/D increases as the angle increases, and an addition of weight will therefore improve the overall efficiency of the machine, although it will increase its total resistance.

It is evident that the best arrangement for one condition of flight may not be the best for all, and it is necessary to specify the speed or angle to be considered if a rigorous determination of the best form of strut, the best wing section, or anything else of a like nature, is to be made. Where all-around efficiency at all speeds is desired, a compromise must be made between the various arrangements best suited for particular sets of conditions. In the present investigation, the best type of strut will first be determined for the angle corresponding to the maximum L/D ratio for the complete machine. This is in the neighborhood of (a little smaller than) the best climbing angle. The maximum L/D varies considerably with the type of airplane, but 7.5 may be taken as a fair average value. An increase of 7.5 lb. in the weight of the airplane will then require an increase of 1 lb. in the propeller thrust, and this increase would be substantially the same, in this particular case, whether the necessary gain in lift were secured by an increase of speed or an increase of angle. An increase of 7.5 lb. in the weight

of an interplane strut is therefore equivalent to an increase of 1 lb. in the resistance. The "equivalent weight" of any strut is then

$$W_e = W + 7.5 R,$$

where W is the weight of the strut and R its parasite resistance at the speed normally corresponding to flight at the angle of maximum L/D. The relative merits of struts of different sections are indicated by the values of W_e , that section being the best which has the smallest value for this quantity. In order to make the comparison a fair one, the struts compared must, of course, be of equal strength. Since their length is very great in comparison with their diameter, the failing load of interplane struts is determined by Euler's formula, and struts of equal strength must therefore have the same least sectional moment of inertia. The simplest means of making comparisons among a series of struts is to choose a diameter for some standard section and compute the diameter which struts of the various other sections would have to have in order that they might have the same least moment of inertia, and so the same strength. Knowing this, the weight, resistance and "equivalent weight" can be computed for struts of each section.

The relative values of the merit factors for the various sections depend somewhat on the diameter initially chosen for the standard section. Since the weight per unit of length goes up as the square of the diameter, while the resistance only varies as the first power, the weight becomes more and more important as the diameter increases, and it is profitable on large airplanes to use struts of smaller fineness ratio, greater weight-strength efficiency and larger resistance than would be advisable on small machines where the strut weight is small in any case. A number of strut sections of different forms are shown in Fig. 1 and the weight per running foot, resistance per running foot at 60 m.p.h., and merit factor W_e , are tabulated below for two different assumptions. The first set of figures relate to struts having a strength equal to that of a circular rod 1 in. in diameter, the second set to struts equal in strength to a circular rod 2½ in. in diameter, these being taken as representative of the extremes of size met with in present-day practice. The column headed b gives the width of section, measured perpendicular to the wind direction, of a strut having the required strength. Most of the struts included in the table were tested at the British National Physical Laboratory during 1912 and 1913, some of them having been designed by the staffs of the Laboratory and the Royal Aircraft Factory, the remainder having been tried at the suggestion of Alec Ogilvie. A few of the sections, however, have been more recently developed here and abroad. Two or three simple geometrical forms are included for comparison. The weights are for solid spruce struts. If a higher speed than 60 m.p.h. were to be used as a stand-

*Chief Physicist National Advisory Committee for Aeronautics.

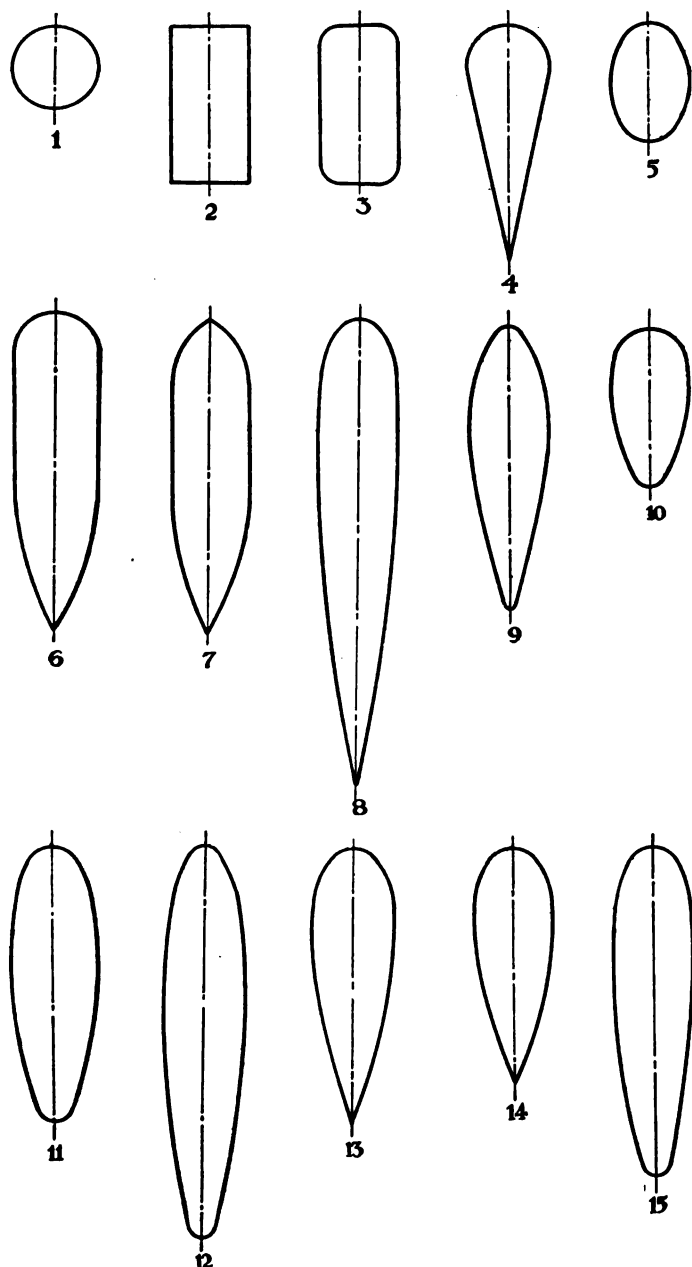


Fig. 1

ard of comparison, the struts of low resistance and fairly high fineness ratio would make a better showing.

No. of strut	First Series.				Second Series.			
	b	W	R	W_e	b	W	R	W_e
1	1.000	0.164	0.819	6.30	2.50	1.03	2.018	16.41
2	0.735	0.225	0.768	5.98	1.84	1.41	1.920	15.81
3	0.779	0.229	0.223	1.90	1.95	1.43	0.558	5.62
4	0.905	0.274	0.570	4.55	2.26	1.71	1.425	12.40
5	0.794	0.220	0.293	2.42	1.98	1.38	0.733	6.88
6	0.684	0.314	0.112	1.15	1.71	1.96	0.280	4.06
7	0.705	0.309	0.095	1.02	1.76	1.93	0.238	3.72
8	0.676	0.411	0.091	1.09	1.69	2.57	0.228	4.28
9	0.713	0.313	0.105	1.10	1.78	1.96	0.263	3.93
10	0.845	0.228	0.210	1.80	2.11	1.43	0.525	5.37
11	0.735	0.303	0.084	0.933	1.84	1.89	0.210	3.47
12	0.676	0.398	0.082	1.01	1.69	2.49	0.205	4.03
13	0.751	0.290	0.074	0.845	1.81	1.81	0.185	3.19
14	0.784	0.271	0.091	0.953	1.96	1.69	0.228	3.40
15	0.696	0.339	0.104	1.12	1.74	2.12	0.260	4.07

It will be noted that, while No. 13 has the lowest "equivalent weight" for both cases, there are numerous changes in order between the two, in so far as the other struts are concerned, and that, in general, the struts of small fineness ratio stand better in the second tabulation than in the first.

In the discussion thus far it has been assumed that all struts are solid. The same method of comparison will now be extended to hollow struts, to determine the amount

of hollowing which is profitable in struts of any given form. It will be assumed, for the purposes of the analysis, that the cross-sectional form of the inner boundary of the cross-section of the hollow strut is geometrically similar to that of the outer boundary. In other words, the thickness of the wall varies at different points, being greatest at the front and back, least on the sides. This is not, of course, by any means the usual way of making a hollow strut, but it is an assumption which greatly simplifies the treatment, and the effect of departures from it will be discussed later in the article.

In what follows, b_1 and b_2 refer, respectively, to the outside and inside breadths of the cross-section, and C_1 , C_2 , etc., are arbitrary constants, depending on the type of strut and on the other conditions of the problem.

Since the resistance depends only on the outside dimensions, it may be written

$$R = C_1 \times b_1$$

The weight per unit length is given by the expression

$$W = C_2 (b_1^2 - b_2^2)$$

and the moment of inertia of the cross-section by

$$I = C_3 (b_1^4 - b_2^4) = W \times \frac{C_3}{C_2} \times (b_1^2 + b_2^2)$$

Since the moment of inertia is constant for a given strength (it is assumed that the walls are thick enough to prevent local buckling or crinkling, so that failure will occur in every case by elastic instability of the strut as a whole).

$$I = K$$

where K is another constant depending on the required strength of the member.

Then

$$K = W \times \frac{C_3}{C_2} \times (b_1^2 + b_2^2)$$

And

$$W = K \times \frac{C_2}{C_3} \times \frac{1}{b_1^2 + b_2^2}$$

The "equivalent weight" is then

$$W_e = \left(K \times \frac{C_2}{C_3} \times \frac{1}{b_1^2 + b_2^2} \right) + (7.5 \times C_1 \times b_1)$$

From the equation for moment of inertia,

$$b_2 = \sqrt[4]{b_1^4 - \frac{K}{C_3}}$$

Substituting this value in the preceding expression,

$$W_e = \left(K \times \frac{C_2}{C_3} \times \frac{1}{b_1^2 + \sqrt{b_1^4 - \frac{K}{C_3}}} \right) + (7.5 \times C_1 \times b_1)$$

In order that W_e may be a minimum, its derivative with respect to b_1 must be zero.

$$\frac{dW_e}{db_1} = - \left[K \times \frac{C_2}{C_3} \times \frac{2b_1 + \frac{4b_1^3}{2\sqrt{b_1^4 - \frac{K}{C_3}}}}{\left(b_1^2 + \sqrt{b_1^4 - \frac{K}{C_3}} \right)^2} \right] + 7.5 C_1 = 0$$

$$7.5 C_1 = 2 K \times \frac{C_2}{C_3} \times b_1 \times \frac{1}{\left(b_1^2 + \sqrt{b_1^4 - \frac{K}{C_3}} \right) \times \sqrt{b_1^4 - \frac{K}{C_3}}} = 2 K \times \frac{C_2}{C_3} \times b_1 \times \frac{1}{(b_1^2 + b_2^2) \times b_1^2}$$

The values of b_1 and b_2 which satisfy this equation can be found by trial.

Suppose, for example, that it is desired to find the best degree of hollowing for a strut which must have a least moment of inertia of 1 in.⁴ and which is to be used on a machine traveling at 60 m.p.h. C_1 may be taken at 0.1, C_2 as 0.515, and C_3 as 0.155, these figures being approximately correct for strut No. 13 in the table.

Then

$$7.5 C_1 - 2K \times \frac{C_2}{C_1} \times b_1 \times \frac{1}{(b_1^2 + b_2^2) \times b_2^2} = .75 - \frac{6.65 b_1}{(b_1^2 + b_2^2) \times b_2^2} = \frac{dW_e}{db_1}$$

A series of values may then be tried and the results tabulated.

b_1	b_2	$\frac{dW_e}{db_1}$
1.60	0.59	-9.70
1.65	0.99	-2.28
1.70	1.17	-1.18
1.75	1.31	-2.28
1.80	1.42	-0.37
1.85	1.51	-0.20
1.90	1.60	-0.06
1.95	1.68	+0.06

It is evident that the best dimensions for this strut would be:

$$b_1 = 1.92 \text{ in. } b_2 = 1.64 \text{ in.}$$

For a hollow strut of that size W_e would be 1.96, as against 2.50 for a solid strut of the same strength. The substitution of hollow struts for solid ones therefore leads to a clear saving of 22 per cent of the total power required to carry those members and overcome their resistance during a climb at 60 m.p.h.

The equation for $\frac{dW_e}{db_1}$ is not independent of b_1 and it is profitable to hollow out large struts more in proportion to their size than small ones. If, for instance, in the example just taken up, the required value of I were 0.2 in.⁴ instead of 1.0 in.⁴, the best values of b_1 and b_2 would be 1.21 and 0.96 in., respectively. For this strut the best wall thickness would be 10 per cent of the breadth, whereas, for the larger strut previously considered, it was only 7.3 per cent.

Increasing the speed accentuates the importance of resistance, which depends only on outside dimensions, and the effect is therefore of the same nature as is that of decreasing required strength. If a strut were to be chosen to have a moment of inertia of 0.2 in.⁴ and to be used at 80 m.p.h., the outside and inside breadths should be 1.15 and 0.82 in. respectively.

An analysis of the same sort may be carried through for tubular steel struts. Since the interplane struts are always long enough to fail by buckling, their crippling load depends only on the modulus of elasticity of the material and the least moment of inertia of the cross-section. The modulus of elasticity of steel being about 17.5 times as great as that of spruce, the sectional moment of inertia of a wooden strut must be 17.5 times as great as that of a metal one for a similar situation. Reverting to the first numerical case which was considered, I for a

steel strut would have to be 0.0571 in.⁴. The equation for the slope of the "equivalent weight" curve would be:

$$\frac{dW_e}{db_1} = 0.75 - \frac{6.08 b_1}{(b_1^2 + b_2^2) \times b_2^2}$$

and the best dimensions:

$$b_1 = 1.630 \text{ in. } b_2 = 1.607 \text{ in.}$$

The difference between the outside and inside breadths is so small that the walls would be unable to resist crinkling, so that the only rule that can be laid down in this case, as for most other problems involving steel struts, is, that the walls of the tube should be made as thin as possible without risking local failure. If the strut were made to the ideal dimensions just determined, W_e would be 1.80, or about 8 per cent less than for the best hollow wooden strut to fulfill the same conditions. At higher speeds the steel strut would show up still better in comparison with the wooden one. The steel struts are also well fitted for use where great strength is required, as the wall thickness can be brought nearer to the ideal in a large strut than in a small one, especially if the large strut is built up of sheet metal and provided with internal reinforcing to guard against crinkling or other local failure.

The discussion so far has dealt entirely with the performance of struts under the conditions corresponding to best rate of climb. In many cases, particularly in the case of pursuit machines, efficiency at maximum speed is quite as important as at economical speed, and the best form of strut for use at small angles of attack and high speeds will now be taken up.

It will be assumed that the loading per unit of wing area is maintained constant in all conditions, and that the angle of attack for a given speed therefore has the same value, whatever strut may be used. The assumption will further be made that the total resistance at maximum speed is equally divided between wing drag and parasite resistance. This approximates the distribution of resistance in most fast airplanes. Any increase in strut weight will require an increase in area of supporting surface in order that the loading may be kept constant. The increased surface, in turn, will require a greater length of struts and wires for bracing, and will therefore be the direct cause of an increase in parasite resistance. The parasite resistance of the body and chassis is substantially independent of the area of supporting surface, and it may therefore be assumed that the total parasite resistance varies as the square root of the wing area.

The equation for total resistance is then:

$$R = D_e SV^2 + K' \sqrt{S} V^2$$

where D_e is the drag coefficient of the wings and K' is a coefficient of total parasite resistance. Since S is proportional to W , the total weight of the machine,

$$R = (C'W + C''\sqrt{W}) \times V^2$$

Differentiating to determine the effect which a change in W has on R ,

$$\frac{dR}{dW} = \left(C' + \frac{C''}{2\sqrt{W}} \right) V^2$$

Since parasite resistance and wing drag were initially equal,

$$C'W_e = C''\sqrt{W_e}$$

$$\frac{C'}{C''} = \frac{1}{\sqrt{W_e}}$$

As any changes in W due to change of the struts would be relatively small, W_0 may be substituted for W in the expression for the derivative, which then becomes:

$$\frac{dR}{dW} = \frac{3}{2} \times C' V^2$$

Since

$$C' W V^2 = D_c S V^2$$

and

$$W = L_c S V^2,$$

$$C' V^2 = \frac{D_c}{L_c}$$

and

$$\frac{dR}{dW} = \frac{3}{2} \times \frac{L_c}{D_c}$$

where $\frac{L_c}{D_c}$ is the lift-drag ratio for the wings alone.

The increase in weight due to the use of heavier struts includes not only the added weight of the struts themselves, but also the weight of the added wing surface required to keep the loading constant. As the weight of the wings and their trussing is about one-eighth of the total weight of an airplane, the added wing weight will be one-seventh of the added strut weight. The formula for the total resistance due to weight of struts is then:

$$R = \frac{8}{7} \times \frac{3}{2} \times \frac{1}{L_c} \times W = \frac{12}{7} \times \frac{L_c}{D_c} \times W$$

Adding to this the resistance of the strut itself, the total "equivalent resistance" of one foot of strut is

$$R_e = \left(\frac{12}{7} \times \frac{L_c}{D_c} \times W \right) + R$$

For biplanes in which the maximum speed is two and a half times the landing speed, this being the average ratio of speed range for present-day fighting machines, the lift-drag for the wings alone is about 9 at maximum speed. The equation for "equivalent resistance" is then:

$$R_e = \frac{12}{7 \times 9} \times W + R$$

Dividing by the coefficient of W to secure the "equivalent weight,"

$$W_e = W + 5.25 \times R$$

where R is the resistance of one foot of strut at the maximum speed of flight.

As an illustrative example, a strut may be designed for the third of the cases examined at climbing speed (least moment of inertia = 0.2 in.⁴). The maximum speed may be taken as 130 m.p.h., this being about the figure which would be realized in a pursuit machine having an economical speed of 80 m.p.h. The best dimensions for a strut under this condition are:

$$b_1 = 1.10 \text{ in.}, b_2 = 0.65 \text{ in.},$$

and the reduction in "equivalent weight" by using this strut instead of a solid one is only 3 per cent. Solving the same problem for a steel tubular strut,

$$b_1 = 0.691 \text{ in.}, b_2 = 0.626 \text{ in.},$$

and W_e is reduced 23 per cent as compared with the value for the best wooden strut.

The analysis has so far been confined, as already noted, to the case in which the form of the hollowed-out portion

is geometrically similar to the cross-sectional form of the strut. This assumption of similarity simplifies the algebraic work and does very well as a first approximation, but a second approximation can be made, if desired, taking account of the true form much more closely. The same equations may now be written down for a strut of constant wall thickness, working under the same conditions as those for which the approximate analysis has already been carried through—

$$(I = 1.0 \text{ in.}^4, \text{ speed of 60 m.p.h., strut No. 13}).$$

Strut No. 13 in Fig. 1 has a fineness ratio (ratio of length to breadth of section) of 3.5. The form of strut originally determined, with the inner and outer outlines of similar form, is shown in Fig. 2, from which it is perfectly evident that an unnecessarily large amount of material is concentrated in the nose and tail of the section. If the wall thickness is kept constant at all points of the periphery, the relations among the dimensions are:

$$b_1 - b_2 = l_1 - l_2 = 3.5 b_1 - l_1 \\ l_2 - b_2 = 2.5 b_1$$

where l_1 and l_2 are the lengths of the strut section and of the section of the hollowed-out portion, as shown in Fig. 2. The fineness ratio of the hole is then

$$\frac{l_2}{b_2} = \frac{2.5 b_1 + b_2}{b_2} = 1 + \left(2.5 \times \frac{b_1}{b_2} \right)$$

Struts which are alike in every respect except in fineness ratio have coefficients in weight and of moment of inertia proportional to their fineness ratios. The deduction of weight and moment of inertia due to the removal of the central portion of the section must therefore be increased in the ratio

$$\frac{1 + \left(2.5 \times \frac{b_1}{b_2} \right)}{3.5}$$

The equation for weight per running foot of strut No. 13 becomes

$$W = .515 \times \left[b_1^2 - b_2^2 \times \frac{1 + \left(2.5 \times \frac{b_1}{b_2} \right)}{3.5} \right] = .147 \times [3.5 b_1^2 - b_2^2 - 2.5 b_1 \times b_2]$$

The resistance of a running foot at 60 m.p.h. is, as before,

$$R = 0.1 b_1$$

and the "equivalent weight" is

$$W_e = 0.147 \times [3.5 b_1^2 - b_2^2 - 2.5 b_1 \times b_2] + 0.75 b_1$$

Then

$$\frac{dW_e}{db_1} = 0.147 \times \left(7 b_1 - 2 b_2 \times \frac{db_2}{db_1} - 2.5 b_2 - 2.5 b_1 \times \frac{db_2}{db_1} \right) + 0.75$$

Since the moment of inertia of the section of material removed, like its weight, is directly proportional to the fineness ratio,

$$I = 0.155 \times \left[b_1^4 - b_2^4 \times \frac{1 + \left(2.5 \times \frac{b_1}{b_2} \right)}{3.5} \right] \\ = 0.044 \times [3.5 b_1^4 - b_2^4 - 2.5 b_1 \times b_2^3]$$

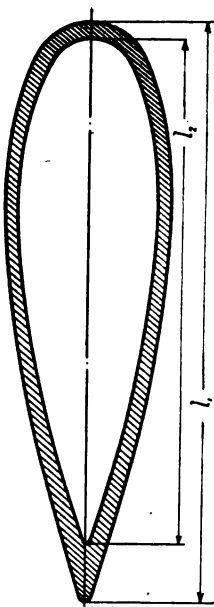


Fig. 2

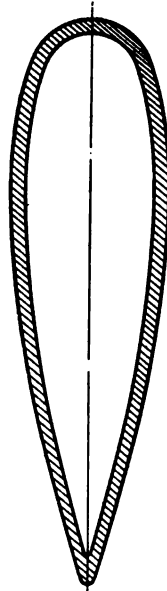


Fig. 3

I being fixed, the differential of this expression may be taken:

$$14 b_1^2 \times db_1 - 4 b_1^2 \times db_2 - 2.5 b_1^2 \times db_1 - 7.5 b_1 \times b_2^2 \times db_2 = 0$$

$$\frac{db_2}{db_1} = \frac{14 b_1^2 - 2.5 b_1^2}{4 b_1^2 + 7.5 b_1 \times b_2^2}$$

Substituting this value in the expression for the derivative of W_e with respect to b_1 ,

$$\frac{dW_e}{db_1} = 0.147 \times \left[7 b_1 - 2.5 b_2 - (2.5 b_1 + 2 b_2) \left(\frac{14 b_1^2 - 2.5 b_1^2}{4 b_1^2 + 7.5 b_1 \times b_2^2} \right) \right] + 0.75$$

This derivative may be equated to zero, and the resulting equation solved by trial. The process is rather a tedious one, as it requires, as a preliminary step, the determina-

tion by trial of a number of pairs of values of b_1 and b_2 for which the moment of inertia of the strut has the required value.

The values which give the minimum value of W_e in this problem are:

$$b_1 = 1.87 \text{ in.} \quad l_1 = 6.55 \text{ in.}$$

$$b_2 = 1.49 \text{ in.} \quad l_2 = 6.17 \text{ in.}$$

and the value of W_e for this best strut is 1.85, about 6 per cent better than the best obtainable when the form of the hollowed-out portion is geometrically similar to the exterior outline. The form of strut arrived at is shown in Fig. 3 for comparison with the form originally derived and illustrated in Fig. 2.

The complete analysis for the case of constant wall thickness is too tedious to be carried through as a regular feature of strut design. It will be noticed, however, that the value of b , obtained by this method, is very closely equal to that found by the simpler analysis, and the latter can be run through in ten minutes for any size of strut or speed of flight, once the general properties of the section employed are known.

The procedure to be followed in estimating approximately the best dimensions for a hollow strut may then be summarized as follows:

1. Determine the best dimensions on the assumption of geometrically similar inside and outside outlines, in accordance with the method developed in the first part of this article.

2. Using the outside dimensions obtained in (1), find by trial the inside diameter which gives the required moment of inertia when the wall thickness is constant. The constant wall thickness required will, in general, be approximately equal to the minimum wall thickness

$\left(\frac{b_1 - b_2}{2} \right)$ determined in (1), multiplied by the fourth root of the fineness ratio of the section.

In conclusion, and in recapitulation, the merits of hollow wooden struts on large airplanes of low or moderate speed, and of tubular steel ones on very fast machines of any size, may be urged with emphasis. The saving in "equivalent weight" and in power consumption more than justifies the added cost of construction.

Fahrenheit-Centigrade Thermometer Scales Compared

F.	C.	F.	C.	F.	C.	F.	C.	F.	C.	F.	C.	F.	C.	F.	C.	F.	C.	F.	C.
212	100	185	85.0	158	70.0	131	55.0	104	40.0	77	25.0	50	10.0	23	-5.0	-3	-19.4	-30	-34.4
211	99.4	184	84.4	157	69.4	130	54.4	103	39.4	76	24.4	49	9.4	22	-5.6	-4	-20.0	-31	-35.0
210	98.9	183	83.9	156	68.9	129	53.9	102	38.9	75	23.9	48	8.9	21	-6.1	-5	-20.6	-32	-35.6
209	98.3	182	83.3	155	68.3	128	53.3	101	38.3	74	23.3	47	8.3	20	-6.7	-6	-21.1	-33	-36.1
208	97.8	181	82.8	154	67.8	127	52.8	100	37.8	73	22.8	46	7.8	19	-7.2	-7	-21.7	-34	-36.7
207	97.2	180	82.2	153	67.2	126	52.2	99	37.2	72	22.2	45	7.2	18	-7.8	-8	-22.2	-35	-37.2
206	96.7	179	81.7	152	66.7	125	51.7	98	36.7	71	21.7	44	6.7	17	-8.3	-9	-22.8	-36	-37.8
205	96.1	178	81.1	151	66.1	124	51.1	97	36.1	70	21.1	43	6.1	16	-8.9	-10	-23.3	-37	-38.3
204	95.6	177	80.6	150	65.6	123	50.6	96	35.6	69	20.6	42	5.6	15	-9.4	-11	-23.9	-38	-38.9
203	95.0	176	80.0	149	65.0	122	50.0	95	35.0	68	20.0	41	5.0	14	-10.0	-12	-24.4	-39	-39.4
202	94.4	175	79.4	148	64.4	121	49.4	94	34.4	67	19.4	40	4.4	13	-10.6	-13	-25.0	-40	-40.0
201	93.9	174	78.9	147	63.9	120	48.9	93	33.9	66	18.9	39	3.9	12	-11.1	-14	-25.6	-41	-40.6
200	93.3	173	78.3	146	63.3	119	48.3	92	33.3	65	18.3	38	3.3	11	-11.7	-15	-26.1	-42	-41.1
199	92.8	172	77.8	145	62.8	118	47.8	91	32.8	64	17.8	37	2.8	10	-12.2	-16	-26.7	-43	-41.7
198	92.2	171	77.2	144	62.2	117	47.2	90	32.2	63	17.2	36	2.2	9	-12.8	-17	-27.2	-44	-42.2
197	91.7	170	76.7	143	61.7	116	46.7	89	31.7	62	16.7	35	1.7	8	-13.3	-18	-27.8	-45	-42.8
196	91.1	169	76.1	142	61.1	115	46.1	88	31.1	61	16.1	34	1.1	7	-13.9	-19	-28.3	-46	-43.3
195	90.6	168	75.6	141	60.6	114	45.6	87	30.6	60	15.6	33	0.6	6	-14.4	-20	-28.9	-47	-43.9
194	90.0	167	75.0	140	60.0	113	45.0	86	30.0	59	15.0	32	0.0	5	-15.0	-21	-29.4	-48	-44.4
193	89.4	166	74.4	139	59.4	112	44.4	85	29.4	58	14.4	31	-0.6	4	-15.6	-22	-30.0	-49	-45.0
192	88.9	165	73.9	138	58.9	111	43.9	84	28.9	57	13.9	30	-1.1	3	-16.1	-23	-30.6	-50	-45.6
191	88.3	164	73.3	137	58.3	110	43.3	83	28.3	56	13.3	29	-1.7	2	-16.7	-24	-31.1	-51	-46.1
190	87.8	163	72.8	136	57.8	109	42.8	82	27.8	55	12.8	28	-2.2	1	-17.2	-25	-31.7	-52	-46.7
189	87.2	162	72.2	135	57.2	108	42.2	81	27.2	54	12.2	27	-2.8	0	-17.8	-26	-32.2	-53	-47.2
188	86.7	161	71.7	134	56.7	107	41.7	80	26.7	53	11.7	26	-3.3	-1	-18.3	-27	-32.8	-54	-47.8
187	86.1	160	71.1	133	56.1	106	41.1	79	26.1	52	11.1	25	-3.9	-2	-18.9	-28	-33.3	-55	-48.3
186	85.6	159	70.6	132	55.6	105	40.6	78	25.6	51	10.6	24	-4.4	.....	.....	-29	-33.9	.....	.....



Engine Rating Formulae

Editor AUTOMOTIVE INDUSTRIES:

IT was in October, 1916, that I asked the Editor of THE AUTOMOBILE whether anything had been done to bring about the adoption of a horsepower rating based on piston displacement. "Practical Engine Rating" was subsequently written by Edward G. Ingram, who has re-written part of this interesting discussion in AUTOMOTIVE INDUSTRIES of Dec. 4, 1919.

In AUTOMOTIVE INDUSTRIES for Nov. 13, 1919, P. M. Heldt develops piston displacement formulae from mean effective pressures. His results for passenger car and truck engines are practically the same as the rating I proposed in AUTOMOTIVE INDUSTRIES Oct. 9, 1919, which was $P. D./10 = H. P.$

In the Dec. 4, 1919 issue, John Jay Ide states that my $P. D./10$ rating is too complete because it contains π (3.1416). I think this is very little to worry over, for the large majority of manufacturers state in their catalog the piston displacement of the engines they use and, if a piston displacement rating were adopted, they would all list the piston displacement of each engine they manufacture or use. It is easy enough to divide this figure by 10 to obtain rated horsepower.

It is quite true, Mr. Ide states, that the N. A. C. C. rating at least possesses the merit of simplicity. Nevertheless I maintain that it is absurd because, by its use, all engines of a similar bore are rated and taxed the same, regardless of piston displacement.

The speed of 1000 r.p.m., on which I based my rating of $P. D./10 = H. P.$ was not assumed but was chosen for the following reasons:

1. It is the speed, I believe, at which the horsepower of engines varies the least.
2. It is probably the most used speed of passenger car engines, corresponding to car speeds of 20 to 25 m.p.h.
3. It might be considered as the average speed of truck engines.
4. It is the speed at which the horsepower developed is approximately one-half of the maximum.
5. A horsepower formula, when used for tax rating, should not indicate the maximum power, when this maximum is seldom used.

As Mr. Ide points out, the rating $P. D./10 = H. P.$ consistently under-rates the actual power of all the engines listed in my Table II but is not that more desirable than to over-rate some of them?

Although Mr. Ide did not mention the fact, the rating he submitted, namely, $H. P. = B^2SN$, is precisely the Denby-Marshall formula, which I must say was unknown to me when I proposed the $H. P. = P. D./10$ rating. However, the Denby-Marshall formula is also a piston displacement rating. It is equivalent to $P. D./9.42 = H. P.$

Mr. Ide criticized my choosing 1000 r.p.m. for the $H. P. = P. D./10$ rating and later on he states that he assumed 1000 r.p.m. for the $H. P. = B^2SN/12$. How could he have assumed any other speed when the Denby-Marshall formula is based on 1000 r.p.m.

The formula, $H. P. = B^2SNR/12,000$ suggested by Mr.

Ide, would not be suitable for high speeds because it will considerably over-rate most engines. For example, according to the above formula, a $3\frac{1}{2} \times 5$ -in., 4-cylinder engine would be rated at 49 hp. at 2400 r.p.m. and a 4×6 -in. four would rate 77 hp. at 2400 r.p.m. At 3000 r.p.m. they would rate at 61 hp. and 96 hp. respectively. Engines can be designed to perform as well as this at 2400 and 3000 r.p.m. but such performance certainly does not represent the average.

RALPH C. CHESNUTT.

Theory of Third Brush Regulation

Editor AUTOMOTIVE INDUSTRIES:

As an appreciative and regular reader of AUTOMOTIVE INDUSTRIES, I have gathered up courage to write you regarding a subject of great interest to me and (I believe) many others.

I am, and have been since its inception, engaged in auto electric service work and have given the subject a good deal of study.

Having superintended the repair and testing of all makes and types of automobile generators, I have been impressed of late with the peculiarities of the third brush controlled generator. I have worked out my own theory of third brush regulation, which is fairly satisfactory, but I do not find in any of the available so-called text books and service manuals an adequate explanation of the subject. Any of the above sources of information that touch on the subject at all do so in a very casual way and make no attempt to give a comprehensive analysis of the subject. AUTOMOTIVE INDUSTRIES has handled the subject in a similar manner to that mentioned above in its Forum section. That type of explanation is undoubtedly good enough for the layman, but we men specializing in this branch of the industry desire something more. We believe that AUTOMOTIVE INDUSTRIES can supply us with the information we wish.

In view of excellent series of articles on the theory of the magneto recently published, I have taken the privilege of writing to you on this subject. The information I especially desire is:

First: Why does the output of generator drop off as speed is increased above a definite point?

Second: What relation has the setting of the main generator brushes to the control and output curve of a third brush generator?

Third: Why will not the output of some generators return to maximum value when the speed of the generator that has been driven at excessive speed not reduce to the speed at which the maximum output was first reached?

C. C. C.

[We shall be glad to consider articles on the subject of the theory of third brush regulation, covering the points mentioned by our correspondent, from writers competent in this branch of automotive engineering.—Editor.]

THE article on "Tangential Cams," published in the issue of Feb. 5, should have been signed by Ralph M. Gaston, a frequent contributor to this publication.

Better Instruction and Service Books Are Needed

Service is so closely linked with sales that to-day no manufacturer would think of marketing his car without provisions for service. But manufacturers generally appear to have overlooked this immense field for service. Mr. Pile's article was written after he had reviewed the instruction books of practically all leading vehicle makers. The good ones were scarce.

By J. Howard Pile*

THE instruction book that accompanies the new car, truck or tractor, has a distinct mission to perform, and that mission is to assist in keeping the vehicle in good running condition. How the manufacturer ever expects the owner to do this, is, in some cases, a profound mystery. Some of the instruction books are combined with parts price lists and the entire subject of operation and maintenance is condensed into a couple of pages, which is then followed or preceded by a copy of the "Standard Warranty" and detailed instructions as to how to ship defective parts back to the factory.

Not only is such an instruction book almost valueless, but it must certainly produce an effect on the mind of the purchaser which is far from what the sales department would desire. The book tells all the things the company will not do and then graciously gives about three cents' worth of instructions.

Then there is the swing to the other side; the instruction book that has so much information in it that the layman has difficulty in finding the thing he is looking for, and such operations as require a considerable degree of skill are detailed at length. If the layman owner reads this matter, he may feel that he is competent to do the work himself and may get himself into trouble.

A strong evidence that not enough care is spent in the preparation of these books is the fact that such subjects as ignition, carbureters, storage batteries, etc., are generally very well covered for the simple reason that these parts makers have themselves prepared good instruction books and the car makers have simply appropriated all this material and then given scant attention to those parts whose makers have not been thoughtful enough to get up their own instructions.

Instruction books could be made more useful and could materially assist in keeping the vehicles in good running order by giving some thought to the man that reads them. The owners of passenger cars run all the way from the man who does not know there is an engine under the hood to the man who is mechanically inclined and who is able to make most of the minor repairs on his car. An instruction book for the passenger-car owner, to meet the requirements of these variations, should contain complete driving instructions, lubrication charts and directions, notes on the general care of the car and details of minor adjustments that the owner could make to keep it running right. Such operations as scraping bearings, lapping cylinders, and adjusting driving gears, have no place in such a book, yet they are often included and tend only to becloud the rest of the material.

A repair manual for the service station and garage should contain detailed instructions for the repair and overhaul of every part of the car. There is no good reason why copies of this repair manual should be kept out of the owner's hands if he wants it, but it should be given to owners only on request. If the garage and repairshop called upon to make repairs and adjustments to cars is without a repair manual of any kind, the job may be a poor one, with resulting dissatisfaction on the part of the shop that did the repairing, the owner who had to pay for the poor job, and the car maker, who suffers a certain loss in reputation from a poor running car.

A conspicuous example of what should be done is the manuals now issued by the Willys-Overland Co., on the new Overland Four. There is an instruction book for owners and a repair manual for the shop. The latter not only gives detailed instructions in 1, 2, 3 order, but also gives average time limits for every job and the division of the material into these two classes marks a decided step in the right direction. It is to be hoped that other makers will follow the lead taken by Overland.

Wiring diagrams are included in most of the instruction books and some of these are worse than useless. The owner, as a rule, cannot read the diagrams, as they are in "technical drawing." On the other hand, they are not complete enough for the repairman, because they do not show all the internal circuits, nor do they show all the connections. Frequently there are several diagrams in one book referring to different models and the owner must decide which diagram is the right one. Wiring diagrams, intended for car owners, should be drawn in perspective, so that he can see just where the wires go. Lines, jumpers and symbols are useless.

Truck instruction books, on the other hand, must be more complete. The driver is at all times on his toes to keep the truck going and, if any difficulty arises that he does not know how to take care of and the instruction book is silent on that thing, he is up against it and must send for help. There are many difficulties that trucks get into from which passenger cars are free. For instance, in the matter of driving chains, it is not in our recollection that any truck instruction book tells how to get the truck out of a car track when one of the chains slips off or breaks, yet the streets of big cities, time after time are clogged up for minutes and hours because nobody knows what to do. Some chap who knows tells them what to do, and in a minute the truck is out of the way. This is just an instance of what is lacking.

Tractor instruction books offer a still different problem. Trucks and passenger cars are usually within reach of a

* Of Motor World.

repairshop in case of serious trouble, but the tractor is generally miles out in the country and cannot get to the repairshop if there is one. Instruction books for tractors should therefore cover every possible trouble that would be encountered and the owner should be told how to perform every operation from draining the carburetor to scraping in a set of bearings. Copious illustrations should be used in the reading matter so that there can be no possible mistake. All bearing tolerances should be given, valve tappet tolerances, guide marks, timing instructions, etc. Such a book cannot be too complete.

It has been said, and quite truthfully, that the automotive industry is like a three-legged stool. The legs might be called

Manufacture
Sales
Service

If any one of these legs is weak, the stool falls down, no matter how strong the other two legs may be. Instruction books come under the heading of service, because they assist in keeping the vehicle in operation. Not all service is performed at the shop or the service station. By far the most important parts of service are those little things that the owner does to keep the car on the go—such as screwing down grease cups, setting nuts tight, filling the battery with water and keeping the radiator filled. If it is possible to educate the owner to do these things, do them correctly and do them regularly, shop service will be reduced to a minimum because the only reason for coming to the shop will be from accident or natural wear. The big bulk of the work in the service station is the result of carelessness on the part of the owner. To reduce this carelessness—BETTER INSTRUCTION BOOKS.

American Engineering Standards Committee Constitution

AFTER almost three years of preliminary work the revised constitution of the American Engineering Standards Committee, along with the by-laws and rules of procedure, has been adopted and has been ratified by the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Society for Testing Materials, and the three government departments of Commerce, Navy and War. Each of these interests has three representatives on the committee, making a total of 24 members.

On account of the press of other affairs, Professor Adams has given up the chairmanship. A. A. Stevenson, the newly-elected chairman, is a former president of the American Society for Testing Materials, and has been interested in standardization work for many years. C. B. LePage, who acted as secretary during the organization period, was unable to continue the work and has resigned. Dr. P. G. Agnew, formerly of the United States Bureau of Standards, is now permanent secretary, with headquarters at the Engineering Societies Building, 29 West Thirty-ninth Street, New York.

The American Engineering Standards Committee makes it possible to give an international status to American engineering standards and to cooperate with similar organizations in other countries. Similar organizations are now functioning in Great Britain, France, Switzerland, Holland and Canada.

Through the new committee, the methods of arriving at engineering standards will be unified and simplified and, by cooperation, the duplication of standardization work will be prevented. Standards will not be created without giving all interested an opportunity to participate. The "approval" of a standard by the American Engineering Standards Committee does not mean that the committee has itself worked over and approved each detail. It does signify, however, that the work has been carried out by a sectional committee adequately representing the industry concerned and sponsored by one or more bodies of ability, experience and standing, so that the result may stand for what is best in American engineering practice.

So far the committee has approved specifications for standard pipe threads, for which the American Society of Mechanical Engineers and the American Gas Asso-

ciation are sponsors, and is representing America on this subject at an international conference in Paris. Cooperation is in progress with the National Screw Thread Commission, authorized by Congress and composed of representatives of the various technical societies. Through this arrangement, direct cooperative work with the British, which is not possible by the official Commission, is being carried out. The committee also is in active cooperation with the Canadians on bridge specifications, with the British on specifications for machine tools, and with the Swiss on specifications for ball bearings. In each case the detail work is being carried out by sponsor bodies through sectional committees.

A conference participated in by many national organizations interested in industrial safety, has voted that all industrial safety codes be prepared under the auspices of the American Engineering Standards Committee.

Any organization may request the committee to approve standards which it has formulated or to approve committees that it has appointed and by so doing becomes a sponsor society. Two or more organizations may act as joint sponsors. Approval of a standard is given when it is the substantially unanimous conclusion of a section committee made up of representatives of producers, consumers and general interests and so selected that all interests concerned have adequate representation on the section committee.

It is understood that a standard must be referred to as that of the sponsor, using whatever title the sponsor has given it, followed by the statement, "Approved by the American Engineering Standards Committee." The approval may be given in one of three ways: "Recommended Practice," "Tentative Standard" or "American Standard."

In addition to its assistance in the selection of committees and certifying that their work has been done under proper conditions, the committee will act as a bureau of information regarding standardization. It will collect information regarding existing standards and as to the bodies that have formulated or adopted them. This will enable it properly to give the data to those who select a committee to formulate a new standard or revise an old one.

Provision is made for direct representation on the American Engineering Standards Committee, of additional organizations (or groups of organizations) interested in engineering standardization.

Effects of the Disagreeable Job on the Production Curve

Several factors relate to the size of the labor turnover in any plant. Mr. Tipper emphasizes here that these things have a wide influence in keeping high the factory output and asks for a more intelligent understanding.

By Harry Tipper

LAST week I was talking with a man who had visited a number of foundries probably for the first time in his life. One of his comments was significant, although he may not have recognized the fact. He said, "practically all the foundries I went to seemed to me full of smoke and dirt. Of course, I don't understand the technique, and the operations were confusing to me, so that the disagreeable character of the atmosphere and the depressing surroundings were in my mind. But I do not believe I would want to operate a foundry if I had to work in it, no matter how much money I made."

"Well," I said, "perhaps some of the workmen dislike the disagreeable surroundings just as you do. Of course, they are not so sensitive and, of course, they have not had the opportunity to make money in pleasanter occupations and, of course, they are to some extent accustomed to it. But human reactions are much alike, and it is hardly likely that these workers really enjoy the disagreeable conditions."

Undoubtedly this same thought was in Mr. Bullard's mind when he admitted that he could not get the turnover in the foundry down to the same degree as the machine shop, and at the time we had our conversation about it, Mr. Bullard stated he felt pretty sure that the disagreeable character of the work had something to do with it.

Two or three business men who operate with a large number of employees have suggested that it may be necessary for us to pay a man for disagreeable surroundings in his work, just as we pay him for skill.

The point which comes out of these casual statements is not merely the effect of the character and surroundings of the work as one factor in the lack of incentive among the workers, but the fact that the average business man does not go far enough to find out that the workers are animated by sentiments of much the same character as those animating the executive. It is true that they are not so thoroughly developed and they do not find expression as easily. Perhaps they do not realize them. Their actions, however, are not governed by their thoughts, but by their feelings, and their feelings, in a broad way, are similar, varying only in degrees of development.

A good many of our difficulties in understanding the viewpoint of the worker arise from the neglect of this similarity in feeling and the consequent reaction which comes out of it. Just because there is a lot of disagreeable work to be done does not mean that the worker likes to do it and wishes to remain at that work. All the evidence shows that he escapes from it as often and as regularly as he can

and that, while confined to that work, he constantly moves about in the hope of bettering the conditions.

As a friend of mine said to me the other day, "if I just go to a restaurant to eat, I am sure to get tired of it in a week or two and go to some other place. Not that I really expect any improvement, but I want a change in a way, and there is always some hope that things will be a little better in the new place. Unless there is something more than food and eating, nothing can hold me to one place. I have had lots of worse food with some of the cooks we have been obliged to put up with at home, but I enjoy it more and, as a matter of fact, my digestion is better."

Something of the same character creeps into a man's attitude toward his work. Where there is no particular and valuable object in the work and it is just work, he is apt to get tired of the familiar surroundings and try a new place. Where there is no endeavor to respect his individuality and acknowledge it, so that he feels that he is identified as an individual, and where there is no personal relationship to the organization, his attitude is much the same as the man's attitude toward the restaurant spoken about.

The same attitude developed, not by the disagreeable character but by the lack of object in a job, is indicated by the little story told to me the other day by a manufacturer of prominence in the metal trades field. He said that they had hired an Italian to go to work in the factory. As a matter of fact the man had been anxious to start there and so they had hired him for one of the minor jobs where the turnover is somewhat large. After he had gone through the employment department and the other preliminaries, the foreman showed him his job. That particular job was to shovel scrap from a pile into a wheelbarrow and dump it on another pile. The man looked at the job and said in his broken English, "I like to work here but not that job, no good."

As a matter of fact, when you come to think of it, his estimate of the job was pretty correct; any intelligent man would escape from such a job just about as fast as he could accumulate sufficient skill to do something else. Stories of this kind could be multiplied a hundred times. They exist in every department of every factory, and the personal impressions of every man who has to see many manufacturing operations include a good many, but they pass without thought and are not supposed to be of any importance in their reflection upon production.

This is the primary mistake. Because they do not relate to mathematics, to the operation of machines, to the relation of equipment and to those other tangible elements which are dubbed practical, they are

not supposed to count. We call a man a fool because he won't work at what he can do, we call him a floater because he doesn't stick at one job, and we call him a trouble-maker because he is not satisfied, without in the least understanding that these few incidents which come to our notice are only the surface indications of a widespread condition which enlarges our turnover, decreases the production toward the minimum and affects the attitude of the man toward industry. Some day we shall know enough about the effects of these things to make it possible for an expert statistician to calculate how much it costs industry per year to neglect such matters.

Sometimes, indeed, we refuse to see in the instances of individual reaction like this any possibility of a general condition. I should hate to be obliged to count up the number of times that executives have told me: "That's an individual case. Every individual case is different, and you can't provide any general rules therefrom." Perhaps so, but the statement is not conclusive. Insurance actuaries do not know when you and I are due to shuffle off this mortal soil, but they do know how many of us will die between certain ages, with sufficient accuracy to enable the insurance company to build hundreds of millions of dollars worth of business upon those conclusions. The same thing is true of fire and of theft and other items of insurance aimed to provide against the failure of the individual.

In the same way, it is possible to measure from the individual reaction toward work, some of the things which make for careless workmanship, minimum production rates, maximum turnover, suspicion of employer and other items costly to industry. An executive who has been conspicuous for the success of his attempts to educate his workmen to a spirit of appreciation of the organization policy made the statement to me not long ago: "I have learned never to let a casual remark go

by." AND THIS AGREES very thoroughly with the statement made to me some years ago by a public man who was noted for his understanding of human nature: "It is the casual or unconscious statement or action which betrays the real feeling. The deliberate statement or action is too calculated to permit it."

There are four factors which relate to a man's incentive to work and remain at work that are fully determined by our present knowledge and which, in their reaction, have a direct bearing upon the amount and cost of production. These factors are:

1st: The character of the object of the work.

2nd: The character of the surroundings.

3rd: The opportunity for individual expression or skill.

4th: The reward.

The instances which have been mentioned are culled from hundreds that have been brought to my attention simply to suggest the way in which they find expression from time to time.

By examining these hundreds of individual cases in their relation to one and another, it is possible to see that one or more of the four factors mentioned above are indicated in each individual case. They differ only in the individual expression of the matter and not in the reaction revealed. They can be gathered together as thoroughly as the actuary gathers his mortality statistics and with almost as much precision.

It is not possible as yet to state in money the effect they have upon production amount and cost, because their influence is not so definite and ranges through a larger number of degrees of power. But they are always at work and show themselves in the rate of turnover, the increasing difficulty of securing labor for some classes of work, the continual establishment of minimum rates of production and the general dissatisfaction with present industrial organization.

Increasing the Rate of Pay

THE Packard Motor Car Co. is one of the automobile firms, at least, that believes in the efficacy of unsolicited raises as a sincere means of keeping men contented and interested in their work. To carry out the idea in practice it has worked out a practical and successful system of efficiency records under the supervision of the employment department.

These records, which are kept by the rate man of the employment department, relate to every phase of the employee's work. They include his production efficiency, his absences, his lateness, etc. Such a record is kept for every shop employee of the company. It is on the basis of this record that the employee's rate is raised, but a raise is never granted without a consultation with the foreman of the man's department.

Every man is due for a raise at certain stated intervals if his record shows that he is entitled to it. When the time for a certain man's raise is due, the rate man and the foreman get together. The foreman has a general knowledge of the man's ability and working capacity, while the rate man supplies an accurate record of what the man actually has done. Between the two of them, it is decided to give or withhold the raise. While this power of rate adjustment lies ultimately in the hands of the employment department, no case has yet arisen where the final decision was not reached in agreement with the foreman.

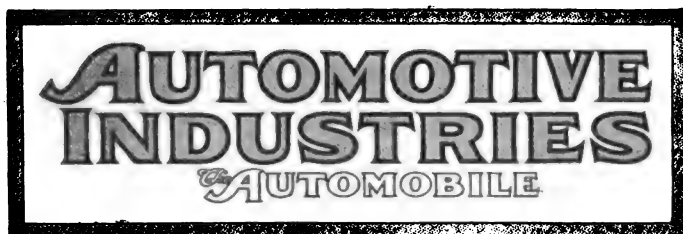
This is considered an essential part of the system, since

it would be detrimental to the morale of the working force if a man were to feel that he owed no obligations to his foreman; that it was not really necessary for him to "make good" with his foreman. That the plan has worked out successfully is, of course, due to the ability of the employment department to gain the co-operation of the foremen in their efforts to do justice to both the men and the company.

Very often the facts of the record will change a hastily formed opinion of a foreman, who may, quite honestly, have based his judgment on a general impression. It is advantageous to the foreman, because it enables him to know absolutely the record of his men in a way that his general supervision of their work would never permit, and it relieves him of the responsibility of being accused of favoritism or unfairness.

When the records show that a man is not, in the opinion of the employment department and the foreman, entitled to a raise when, in the normal course of events, he should be, that man is either called to the employment department for a conference with the rate man or with the foreman. The record is shown to the man and the reasons for his failure to receive a raise are explained. Frequently the facts of his record surprise the man himself.

This plan has the effect of letting the workman know that his individual efforts are being watched and appreciated, and that the company considers him an important unit in the organization.



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Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907, and The Horseless Age (semi-monthly) May, 1918.

Our Forthcoming Engineering Number

ON June 10 next, we will publish our annual Engineering Number, devoted to the progress of the year and to late practice generally in automotive and allied branches of engineering. We hope to make this a better and more valuable issue than last year's Engineering Number, which was greatly appreciated by the profession, and are making preparations to secure suitable articles from widely different quarters.

Any of our readers who have material suitable for publication in this issue are requested to communicate with us at once. We expect to cover all branches of automotive engineering, including the automobile, truck, tractor, motorcycle, aircraft and marine fields, and may also have something on isolated lighting plants and other small stationary power installations. Materials used in automotive engineering, and their treatment, will also be covered. Whatever matter is accepted will be paid for at liberal rates. It will be carefully edited and, when appearing in the Engineering Number of AUTOMOTIVE INDUSTRIES, it will come

to the attention of a large number of readers interested in this class of literature.

All articles and illustrations intended for the Engineering Number should be in our office by May 15.

The Large Tractor

PRACTICALLY all the tractor engineering progress of the past several years has been confined to tractors of small and moderate size, the 4-plow tractor being the largest type that has shown any tendency to become modernized. It is generally realized that the big demand in the future will be for tractors of 2- to 4-plow capacity, yet at each succeeding show we see large machines pulling up to 10 plows, and in considerable numbers. As show space is expensive, it can only be concluded that there is still quite a demand for these big tractors. Inquiries among the manufacturers show that such machines meet with a steady sale, for use in road building, on large farms, etc.

As compared with the up-to-date 3-plow tractor, the big machines are crude and relatively inefficient. Much of the engineering effort expended on tractors recently has been with the object of reducing weight, so as to eliminate some of the loss incident to moving the tractor itself over the field. It is generally believed that the minimum weight limit of a farm tractor depends directly upon the maximum drawbar pull the tractor is expected to exert. A modern 3-plow machine generally weighs about 5000 lb. and will exert a drawbar pull of about 2500 lb., or one-half its own weight. Some of the large tractors, on the other hand, are limited to a maximum drawbar pull at plowing speed equal to only about one-fourth their weight, this in spite of the fact that the speeds of these large tractors are generally somewhat lower.

This method of comparison, based on the weight-drawbar pull ratio, is undoubtedly somewhat crude, because the element of speed is left out of consideration. A better basis would be the weight per drawbar horsepower. The later designs of 3-plow tractors weigh about 350 lb. per drawbar horsepower, but the large 8-10-plow tractors average nearly twice this weight. It is therefore evident that there is much unnecessary weight in these big machines.

In revising the design of the big tractors it is, of course, impossible to follow the lines of the smaller ones in all respects. Owing to the limited demand it is commercially impossible to tool up to the same extent. The backbone style of construction, which has become so popular for the smaller tractor, does not lend itself to the bigger one, because of the tooling difficulty and also because the individual units or castings would be so heavy that they could not be readily handled on the farm. It is, therefore, likely that the large tractor will retain its general form, comprising a structural steel frame upon which the chief components are separately mounted.

Where there is a chance for considerable improvement is in respect to the weight of the whole assembly. It probably will be necessary to increase the engine speed so as to bring the weight of the engine down. This will also permit of a somewhat lighter gearbox

and frame. At present a great deal of weight is stored in the enormous driving wheels, and it seems reasonable to suppose that these can be reduced in diameter without lowering the working efficiency of the tractor. A further point in respect to which the large tractor should be modernized is the use of plain bearings, which should be replaced by anti-friction bearings.

There have been no marked changes in design in large tractors for some years. Any manufacturer who should bring out a visibly improved type would stand a good chance of reaping the reward which progressiveness deserves.

A Clean Slate

AT a time when the majority of employers throughout this country are doing their utmost to obtain the co-operation and good-will of their workmen, the employer who breaks faith with his employees either directly or indirectly is to be condemned as a menace to industrial peace. With this in mind, the statement of Bernard L. Shientag, counsel to the New York State Industrial Commission, is significant.

Shientag said recently that thousands of employers in New York State fail to carry compensation insurance for their employees, although the law requires them to do so and makes its infringement a misdemeanor. "Since I became counsel to the New York State Industrial Commission," he said, "I have made energetic efforts to secure better compliance with this important provision of the law. Publicity has been resorted to and prosecutions have been instituted."

The importance of this statement lies, not in the mere violation of this particular state law, but in the broader principle underlying industrial relationships. Most employers recognize the fact that the enthusiastic co-operation of their workmen means increased production and better work. In their attempts to gain this co-operation, they are combating the propaganda of radical leaders who find their chief ammunition in actions of employers unfavorable to their workmen. The task of the employer is a difficult one as it is; certainly he should not be hampered in accomplishing it by slackers in his own ranks.

Such facts as those brought out by Shientag are seized upon by every radical in the country and "played up" as additional evidence that the employer is a tyrant and a profit-grabber. In the very nature of the case, such violations of the law become public knowledge; the effort to enforce the law necessitates the use of publicity and prosecutions. The spread of such knowledge creates additional "sore spots" upon which the radical may sprinkle his salt of industrial unrest.

It is unfortunately true that a man is known by the company he keeps and to the radical propagandist an employer is an employer regardless of any distinctions there may be within that class. Every blot of this kind upon the record of any one employer renders more difficult the huge task of other employers in gaining industrial co-operation. For this reason, employers as a group should lend the weight of their opinion against individual members of their group

who persist in the violation of petty or major laws and agreements concerning industrial relations.

With a perfectly clean slate on their own side, employers will then be able with far greater force to condemn utterly those all-too-common breaches of faith which occur through the action of labor leaders or organizations.

Patent Office Efficiency

ONE of the important bills before Congress is that providing appropriations for the Patent Office. It would increase the wages of Patent Office employees, particularly for examiners, and, in view of the fact that wages in the Patent Office are substantially the same as they were forty years ago, the bill should be approved by Congress.

The patent examiners are highly trained men and their work is of great importance to industry. A competent and comprehensive force must be maintained at all times. With patent applications increasing beyond all records and the examiners resigning in large numbers because of their inability to live on their present salaries, the operations of the department are reaching a chaotic state.

Eighty-one of the 431 examiners resigned in 1919 because of low salaries. Few men can be attracted to the training corps for that service. Practically none can be attracted who possess the requisite qualifications for examiners, because of the low salaries.

These men are receiving salaries of \$2,740, including the bonus, and several of these have been offered \$4,500 a year in the commercial world. Likewise the first, second, third and fourth assistant examiners are receiving salaries 50 per cent lower than they can secure in industry. At the same time applications for inventions in 1919 totaled 76,484, as compared with 57,180 in 1918, and trademarks, labels, prints, copies of patents sold, etc., increased in like proportions.

The Patent Office is too important to industry to allow it to suffer, especially so when the present salaries are unjust and unfair to its workers.

Stock Variations

ONE of the worst features of the overcrowded condition of foundries and forge shops is the variation in physical characteristics of the stock furnished the machines in our plants to-day. Not only does it render difficult the proper setting of time limits on machine operations, but it is also responsible for a great shortening of the average life of tools.

Castings are particularly prone to vary. Even under the best conditions it is often difficult to hold the hardness of different heats to anything like a constant figure. Under present conditions the variation is tremendous, and the result is that the average shop is continually disturbed in its calculations on feeds and cutting rates. Forgings, which were formerly held to very close limits on the scleroscope, now vary through a wide range. This is just another one of the factors which will hold production down below what it should be this year, and which, incidentally, will considerably increase the tool costs.

Railroads Move to Relieve Car Shortage

American Railroad Association Takes Action Following Confer- ence with A. C. C.

NEW YORK, March 16.—Considerable improvement in the facilities for shipping automobiles is expected as a result of the recent conference of representatives of the National Automobile Chamber of Commerce with the Car Service Commission of the American Railroad Association at Washington.

As a result of this conference a circular has been issued by the commission to all railroads urging that automobile freight cars can be handled in such a manner as to insure the best service obtainable for the automobile shippers.

The circular points out that the period of maximum requirements for automobile loading is at hand, and continues:

"Shortage of automobile cars, particularly during the past few weeks, has resulted in a large accumulation of shipments in producing territories, and in addition, a considerable number of automobiles have been driven away from the factories and are being held in storage awaiting shipment from various points short of destination.

"Automobile cars are badly scattered and must be in possession of the owners to satisfactorily handle the business and to this end it will be very helpful to the general situation if all railroads will particularize with respect to this equipment.

"Local loading of foreign automobile cars, with miscellaneous freight should be avoided where practicable, and generally, until existing shortages have been relieved, railroads should refrain from furnishing this equipment for loading, other than that for which automobile cars were constructed.

"Loading of foreign automobile cars with miscellaneous freight, where necessary, should be in direct route to owners or to automobile manufacturing territory but not beyond. Otherwise, and in the absence of automobile loading to owning lines, cars should be sent empty to the car owner under car service rules."

The Commission assured the N. A. C. C. that the effect of this circular on the movement and handling of automobile cars would be carefully noted and, if results were not satisfactory, further steps would be taken to gain control of these cars.

Standard Parts Now Under New Officials

CLEVELAND, March 15—Reorganization of Standard Parts Co. has been completed, and the big organization is functioning as consistently as though nothing had occurred to disturb the equilibrium.

J. O. Eaton, the new president, has surrounded himself with a coterie of experts headed by John Younger as vice-

president and assistant general manager, who succeeds J. J. Utz. Younger comes to Standard Parts and brings to the Standard a wide and varied experience as an automotive executive.

D. K. Moore, general manager of the axle plant, is succeeded by C. I. Ochs, who for several years has been associated with President Eaton in the Torsbensen Axle Co. and the Republic Truck organization. G. L. Bitting, for several years with the Timken forces in Detroit, succeeds W. B. Fewell as salesmanager of the axle plant. Another important addition to that end of the company is Charles S. Dahlquist, who succeeds L. P. Kalk as chief engineer.

The Industrial Report

The work of the Industrial Conference has just been completed and issued in final form. The Conference report is very much more complete than anything issued by previous bodies of this kind. It has gone further into the question and has dealt with a larger number of questions which are confronting industry in a general way at this time. On the important question of collective bargaining the Conference has taken a very just position in its recognition of the value of employee representation and the encouragement which should be given to this method. It has provided for other machinery of adjustment through national and regional conferences which are somewhat similar in principle to the Whitley proposals in Great Britain. A large part of the report is taken up with the detailed provisions for these conferences and their application to industry, to public utilities and to governmental employees. Some of the statements which are made under hours of labor, child labor, housing, wages and profit sharing are worthy of study. In general, the report does not present anything particularly new, but it reviews very ably the conditions, the experiments which are going on and the necessities of the case, while its suggestions for improvement are sane and orderly.

REO MERGES DEPARTMENTS

LANSING, MICH., March 15—The advertising department of the Reo Motor Car Co. has been merged with the sales promotion department and will be under the direction of Walter K. Powers, sales promotion manager. This action was taken following the resignation of F. L. Waite as advertising manager.

AUSTIN STOCK SALES POOR

LONDON, Feb. 27 (*Special correspondence*)—It is understood that the Austin Motor company's new capital issue of \$7,500,000 (pre-war rate of exchange) has resulted in 80 per cent being left on the underwriters' hands.

Aluminum Castings Rumors Unfounded

Allyne Denies Stories of Re- ported Contemplated Changes in Management

CLEVELAND, March 15—Reports of dissatisfaction with the management of the Aluminum Manufactures, Inc., formerly the Aluminum Castings Co. were denounced to-day as enemy propaganda by President E. E. Allyne. Allyne insists the Aluminum Co. of America, holding corporation for Aluminum Manufactures, is highly satisfied with the conduct of the affairs of the company over which he has control, and declared statements to the contrary had their origin among disgruntled persons, personally antagonistic to him and in some cases influenced in their attitude by connection with rival companies.

Contradicting the statement that the company had not made money for two years, President Allyne said the company made money during the war, but, like a great many others, did not make money during 1919, chiefly because of the fact of the transition from war to peace work. Aluminum Castings was on a basis of 100 per cent war work up to the time of the armistice and for some time thereafter. Allyne used the short and ugly word in denouncing the report as to the failure of the company to make money, and was equally vehement in expressing himself with regard to the report that the company was not meeting its obligations promptly.

The reports of disaffection in the organization began to be circulated last fall, and a refinancing program engineered by the Aluminum Co. of America, which took over the controlling interest in the stock, appeared to lend color to the rumors. Under the reorganization the company issued \$5,000,000 in preferred stock and 400,000 shares of no par common.

Refinancing Done by Allyne

Allyne declared he engineered the refinancing details, and said he had at all times and still does enjoy the full confidence of the parent company. With regard to the appointment of George Stanley, an official of the Aluminum Co. of America, as vice-president and treasurer of the Aluminum Manufactures, Inc., Allyne said Stanley was brought into the organization at his request to take over the duties of J. J. McCashen, who had resigned.

"The company now is making money, and undergoing expansion that will greatly increase the business," said Allyne. "Under the circumstances, it readily can be seen that reports of dissatisfaction have little basis in fact. If the company were being operated at a loss, or if it were not returning the revenue deemed sufficient by the directors, there might be ground for such rumors. Conditions are such, however, that to any one conversant with the company's affairs such reports are ridiculous."

N.A.C.C. Tells Need of Research Work

Senate Told of Importance of Gasoline Studies to Auto- motive Industry

NEW YORK, March 15—The National Automobile Chamber of Commerce has asked the Senate Appropriations Committee to retain in the Appropriations Bill the item of \$250,000 for expenditure in industrial research in the work of the Bureau of Standards at Washington. It is understood that this item has been reduced to \$50,000.

In asking that the item remain, the chamber has pointed out that during the past ten years the production of crude oil has increased 95 per cent, the production of gasoline 560 per cent and the production of automobiles 1700 per cent. In 1919, which was an abnormally low year, from a standpoint of consumption, there was only a very slight margin between the production of gasoline and its consumption in the United States. In 1920, with no new fields in sight and a rapidly increasing use of gasoline, due to a number of different factors, it appears that the consumption will exceed the production.

The chamber points out that there are two ways in which this situation may be relieved in so far as the automobile industry is concerned: first, by research work which will give us more efficient fuel used by gasoline engines, and, second, an educational campaign which will teach the users of gasoline how to obtain the best results from their fuel. The chamber points out that the research work mentioned is now being carried out by the Automotive Section of the Bureau of Standards, and it believes that the results which may be obtained are of the utmost importance to the people of the United States.

Trade Opportunities in Foreign Markets

WASHINGTON, March 15 — The Bureau of Foreign & Domestic Commerce, Department of Commerce, has received requests for automobiles or parts agencies of business from individuals and companies in foreign countries. These are listed below. For further information address the Bureau of Foreign & Domestic Commerce and specify the Foreign Trade Opportunity Number.

A firm in France desires to purchase and secure an agency for automobiles, motorcycles and accessories. Quotations should be given c.i.f. French port. Correspondence should be in French. Reference. 32216.

A general import representative in Italy desires to secure an agency or purchase aeronautic materials. Correspondence may be in English. Reference. 32221.

A merchant firm in Scotland desires to purchase motorcycles in large quantities, and would also like to receive a

copy of a motorcycle trade paper. Quotations should be given c.i.f. port in Scotland or f.o.b. Atlantic port. Reference. 32233.

A general agency firm in South Africa desires to secure the representation of manufacturers and shippers of automobiles and motorcycles. Reference. 32241.

A firm of importers in New Zealand desires to secure an agency for the sale of motor cars, farm tractors and motor trucks. Payment through bank in New York. Reference. 32261.

A manufacturer in South Africa desires to purchase motor cars and motor accessories. Quotations should be given f.o.b. New York. Payment through bank against documents. Reference. 32262.

N. I. & V. A. Approves "Cash Basis Now" Plan

NEW YORK, March 16—"The time has come to put the implement industry more nearly on a cash basis."

This statement is made in a letter submitted by George N. Peek, chairman of the terms committee, National Implement and Vehicle Association, to the executive committee of the association. The sentiments contained in this letter have the hearty indorsement of the executive committee, which has authorized its distribution among members of the N. I. and V. A.

This letter presents a review of the terms situation in the industry, comparing them with those of the automobile industry. Particular attention is called to "Finance-Acceptance" or "Credit Companies" which are made use of by the automobile manufacturers to aid in keeping the automobile industry on a cash basis.

The terms committee takes the view that the local banks should finance the needs of the local community rather than these outside organizations.

S. A. E. Sets Date for Summer Conference

NEW YORK, March 17—The 1920 summer meeting of the Society of Automotive Engineers will be held at Ottawa Beach, Mich., June 21 to 25, inclusive.

The program, which has been worked out in considerable detail, promises one of the best sessions ever held by the engineers.

The first day will be devoted to the standards committee meetings. The arrangements for the four succeeding days provide for technical sessions in the mornings, recreation and sports afternoons, and one-hour lectures in the evenings on timely topics.

FORD BORDEAUX SHOP BURNED

PARIS, March 1 (*Special Correspondence*)—The body assembly shops of the Ford Motor company at Bordeaux have been completely destroyed by fire.

This will delay the delivery of finished cars, but will not in any way affect the erection of chassis. The Bordeaux factory of the Ford Co. is for assembly only.

Handley-Page Lines May Cross America

British Designer, Visiting America, Has Plans for Mail and Express Lines

CLEVELAND, March 17 — Frederick Handley Page, the British airplane engineer and builder, predicted here that marked improvement in plane design and increased efficiency will reduce the cost of air transport to that of express trains. Page has been here for two days visiting the plants of the Glenn L. Martin and the White companies. He arrived at New York on the steamer Mauretania on March 13 and came at once to Cleveland. He went from here to Chicago.

"The limit of airplane development was by no means reached during the war," he said. "So far, it has been enormous, but I look for great future development. There was an intense demand for production during the war and activities were concentrated on immediate necessities. The wartime development was in the way of improving machines already designed by increasing their size, making them lighter and increasing their power.

"Engine design has reached a high state as a result of the military effort by aircraft and automobile builders. But I expect the future will bring great improvements in air dynamics. Machines will be constructed with much less head resistance.

"We have designed a plane that has twice as much lift as before. That improvement means more efficient machines and cheaper air transport. Great attention is being given to the matter of air routes and to provisions for airdromes and better weather forecasts. Airdromes are as necessary for the operation of aircraft as docks for ocean liners.

"Airplanes will be built requiring less horsepower for a given load. Our new type machine is equipped with two 450-hp. engines capable of carrying 3500 lb., the plane having a total lift of 12,000 lb. It has a top speed of 115 m.p.h., a cruising speed of 105 m.p.h. and will make a non-stop flight of 500 to 600 miles. But I expect the same machine will be improved until, with a total of only 300 hp. it will have the same lift but its carrying capacity will be increased to 4000 lb."

Page stated that he was visiting America to see how work is done in automobile and aircraft plants.

Seeks Interview on Express Matter

NEW YORK, March 16—Before leaving here for Cleveland, Frederick Handley Page made efforts to see R. E. M. Cowie, the vice-president of the American Railway Express Co., who has stated that his company would contract for cargo space on a reliable aerial line operating between New York and Chicago. Cowie, however, was ill and so did not see him. The purpose of the interview was not disclosed.

New Type Engines Must Solve Gasoline Problem, Says Expert

Though Supplies Are Ample for Many Years, Increased Demands Will Cause Prices to Become Serious Matter, Bureau of Mines Official Declares

WASHINGTON, March 13—With production of gasoline rapidly approaching a maximum limit and the numbers of automobiles in this country increasing at the rate of 1,500,000 a year, combined with a growing demand for fuel oil for marine purposes, a possible gasoline famine or at least an important increase in the price of gasoline offers a serious problem, according to N. A. C. Smith of the Bureau of Mines, Department of Interior. This problem, he continues, may be solved by the judicious use of fuel oil, which constitutes over 50 per cent of the products obtained from crude oil refined in this country, and which, if used in engines of the Diesel type and as a method of raising steam under boilers, would be more profitable.

"If engineers are able to design an automobile or truck engine," states Smith, "that will use fuel oil in a satisfactory manner, they will relieve the danger of the impending shortage and make possible the desirable extension of the use of the automobile and truck."

"The last ten years," declared Smith, "have seen an enormous increase in the demand for petroleum products. This increased demand has been felt in all phases of the oil refining industry, especially in the fuel, illuminating and lubricating oil branches. The biggest increase of all, however, has been in the demand for motor gasoline, which has been caused by the tremendously rapid growth in the use of the automobile. The number of cars and trucks in service increased about 1700 per cent from 1909 to 1918. The production of gasoline to meet this demand increased from 13,000,000 bbl. in 1909 to 85,000,000 bbl. in 1918, a gain of 560 per cent. During the same period the production of crude oil in the United States increased only 95 per cent.

Demand Far Outgrows Production

"It will be noted that the demand for gasoline, represented by the number of automobiles and trucks in use, has increased a great deal more than the production of gasoline and seventeen times as much as the increase in the production of crude oil supplies. This increase in demand has been partly offset by the fact that the use of gasoline as a solvent and for cleaning has increased only a little in ten years, so that most of the increase in production has gone to meet the motor car demand.

"It will also be noted that, proportionately, far more gasoline was obtained from the domestic crude produced in the year 1918 than in 1909. This increase has been made by a number of methods, among them the production of gasoline from imported crude oil and

from natural gas, and by cracking fuel oils. But the principal one has been the taking of a larger proportion of the crude as gasoline.

"This gasoline has, consequently, a lower volatility and this fact is the cause of the complaints heard in recent years as to the quality of gasoline. The country has been faced with the problem of sacrificing quality or quantity; of using less volatile gasoline or having a shortage of supply.

Two Million More Cars to Supply

"It is claimed that the number of automobiles in the United States at the end of 1919 was 7,500,000; an increase of almost 1,500,000 throughout the year. It has been predicted that the number of automobiles in use at the end of 1920 will be between 9,000,000 and 10,000,000. The demand for gasoline, therefore, is certain to increase.

"On the other hand, it is possible that the future increase in the production of crude oil from our own wells will be relatively small as compared with recent years, and that though the importations of Mexican crude may be considerably increased, the gasoline content of this crude will continue low as at present, and it becomes a matter of some concern as to whether the production of gasoline can be increased in proportion to the increase of automobiles expected for this and succeeding years.

"It seems unlikely that the quantity of gasoline produced can be increased by using more of the crude and making the product less volatile, as has been done in the past. This is because the next fraction obtained from crude oil—kerosene—is in great demand and the price has doubled since the armistice. The point has been reached where an economic balance is approaching between gasoline and kerosene; thus, if any appreciable quantity of the lighter fractions of kerosene is included with the gasoline it will cause a shortage of kerosene with a consequent increase in the price.

"The other important means of obtaining more gasoline are, to extract it from natural gas and to 'crack' fuel oils. The extraction of gasoline from natural gas is approaching its maximum. It has been a comparatively new industry developed during the last ten years, but the gases that can yield gasoline have largely been exploited and it cannot be expected that there will be the same rate of increase in the production of this 'casing-head' gasoline as in the past.

"The process of cracking fuel oil into gasoline is not subject to the same limitation in the supply of base material,

for fuel oil constitutes a large part of the crude oil refined. However, the changing of fuel oil into gasoline by cracking processes involves a considerable expense and waste of material. Therefore, unless the margin in price between the two is considerable, cracking is not profitable.

"Moreover, the demand for fuel oil has been increasing rapidly during the past year and the price has more than doubled. Our merchant marine, navy and many other large users of fuel oil have come into the market for large quantities and are planning to develop demands that will make the competition more keen. Therefore, it may prove to be unprofitable to crack more of our fuel oil into gasoline, unless the price of gasoline is also increased.

"It is probable then, that the quality of gasoline will not change much in the near future. If the engine and the carburetor of to-day can use the present quality of gasoline in a satisfactory manner, then they can continue to do so for some little time to come. Furthermore, it is probable that the idea of providing for the increase in the number of automobiles by using kerosene as fuel cannot be realized to any very great extent. Considerable amounts of kerosene, the total production of which in this country is only half as much as the production of gasoline, can be diverted to the automobile industry only if automobile users are prepared to pay a price greater than can be afforded in the regular uses of kerosene.

"The use of fuel oil in the internal combustion engine may be the solution of the problem. Fuel oil constitutes over 50 per cent of the products obtained from the crude oils refined in the United States. Some of this fuel oil is a comparatively light and volatile distillate, but much of it is a heavy, viscous tar. It is used to-day for raising steam under boilers, for making or enriching gas, for cracking into gasoline, for metallurgical purposes, and for internal combustion engines of the Diesel type. This last use, considered in a large way, is by far the most efficient. And it is in this use of fuel oil that there is most possibility of solving the question of fuel supply for the automotive trade.

New Engine Real Solution

"If engineers are able to design an automobile or truck engine that will use fuel oil in a satisfactory manner, they will relieve the danger of the impending shortage and make possible the desirable extension of the use of the automobile and truck. An automatic engine using fuel oil can compete against any other large user of fuel oil because this will be the most efficient use to which the oil can be put. Consequently, the supply of motor fuel would be limited only by the total supply of fuel oil.

"One important exception must be made to this statement, and that is, that part of the oil now used as fuel can be made into lubricants. There has not been sufficient demand for lubricants in the past to consume all that that might be made from the crude oils of the country,

and the knowledge of how to obtain high-grade lubricants from certain kinds of oils, has been lacking. This knowledge is rapidly being acquired, and it is probable that our chemists will be able in the future to produce satisfactory lubricants from almost any crude.

Lubricant Demand to Increase

"The demand for these products is certain to increase in the future, for it must be emphasized that lubricants are the most necessary of all the products of crude oil. We might get along without gasoline, kerosene and fuel oil, but the industrial development of to-day would be impossible were it not for the enormous quantities of oil used to lubricate every moving part of our machinery, and these lubricants can be obtained in sufficient quantity only from our petroleum.

"The preceding statements have been made, taking into primary consideration the crude oil supplied by the oil wells of the United States and Mexico. There are, however, several sources of motor fuel which will probably come into use in the future. The most important of these are the enormous quantities of oil-bearing shale, found chiefly in the States of Colorado, Wyoming and Utah. Crude oil very similar to petroleum can be obtained from these shales by distillation processes.

"These shales constitute a reserve of oil many times greater than the supply in the oil fields, but this reserve can be made available only at considerable expense and only after the development on a large scale of mines, retorting plants and refineries. It will require investments of hundreds of millions of dollars and a period of many years to develop the shale industry, but it will eventually be of great value as a source of oil.

"A source of motor fuel which is more important to-day, though possibly of less ultimate value than the deposits of shale, is found in coal tar. When bituminous coal is distilled a considerable number of by-products are produced, among others, a quantity of benzol and toluol. These are usually sold in mixtures known as 'commercial benzol' and this 'benzol' is in use to-day in considerable quantities as a motor fuel.

Old Ovens Lose By-products

"At the present time an average of 75,000 tons per day of bituminous coal is still being distilled in the old-style 'bee-hive' coke ovens, and the tar and volatile products are lost. As by-product coke ovens come into more general use there will be an increasing production of benzol, which can be blended with gasoline and thus add to our motor fuel supply.

"Another substance which can be used for motor fuel is alcohol. Alcohol can be used without blending, in automotive engines, if the carbureters and cylinders are re-designed for efficiency. It cannot be blended directly with gasoline, but mixtures of alcohol, benzol and gasoline can be made which will not separate on standing. Such mixtures are

being used in a limited way at the present time and it is probable that this use of alcohol will increase if the price of motor gasoline increases.

"Alcohol can be produced from a large number of vegetable waste products, such as molasses, small potatoes, etc., and it is probable that it can also be obtained from other vegetable wastes, such as sawdust, although this has not been demonstrated commercially.

Gasoline to Hold Quality

"To sum up, the motor fuel problem must be considered in two aspects; in the immediate future, it is likely that there will be little change in the character of the gasoline sold throughout the United States. Surveys made by the bureau show that the change in volatility of motor gasoline from April, 1919, to January, 1920, is so slight that it is negligible.

"The more distant future is, of course, problematical, but it is estimated that, all sources considered, there will be a sufficient supply of motor fuel, although it is probable that it will be more expensive in proportion to the general run of prices than it is to-day. Some of this fuel can be used as at present, but it will probably be necessary to design new engines to use fuel oil, as it is doubtful if the present gasoline engine and carbureter can be modified.

Berliet Postpones Light Car for Year

PARIS, March 1 (*Special correspondence*)—Berliet, who nearly a year ago announced that he would produce a cheap 15 hp. touring car on American lines, now states that this machine will be held back for one year. This has been done in order to enable the factory to work exclusively on trucks, which are being produced at the rate of 30 per day.

The original plan was that the 15 hp. touring car should go into production at the rate of 10 to 12 per day with a rapid increase to 100 per day. This car is decidedly on American lines, it has a comparatively big 4-cylinder engine, $3\frac{1}{2}$ x 5.1 in. It is provided with an American-made lighting and starting set.

A new factory has been erected since the war with an area of 62 acres for the construction of this car. This surface covers the shops only. The total area covering workmen's dwellings, co-operative stores, and other buildings being 100 acres.

Practically the whole of the engineering industry of Lyons is held up by a strike. Only two or three per cent of the men are at work at the Berliet factory, and production is practically nil.

MARVEL INCORPORATES

WELLAND, ONT., March 12—The incorporation is announced of the Marvel Co., Ltd., of Welland. The new concern will manufacture automobiles and equipment, including the steering device for Ford cars known as the "Marvel."

Gasoline Situation Alarms England

Profiteering Committee Lays High Rates to Powerful Financial Interests in Control

LONDON, March 2 (*Special correspondence*)—The following digest from to-day's Times conveys a good idea of the scope and points of the just-issued report of a special committee on behalf of the central profiteering committee which has been inquiring into the costs and profits of gasoline, benzol and other motor liquid fuels. The exchange conversions are at pre-war rates.

Powerful financial interests are taking advantage of the deficiency of motor fuel to raise prices.

The concentration of control of prices in two enormously powerful "combines," practically world-wide in their scope, constitutes a power so dangerous, should it happen to be improperly used, that prompt international action is imperative.

The two main groups concerned are the Standard Oil and the Royal Dutch Shell.

An exorbitant profit is being procured by the producer or refiner of petrol at present market prices.

Petrol sold at \$115 a ton, f.o.b. New York, shows a grossly excessive profit.

When the Anglo-Persian Oil Company's existing contracts expire in 1922, the British Government, which holds a controlling interest in the company, should insure the sale of the products at a reasonable figure.

A fair average rate of transport could not exceed \$25 per ton (8 cents per gallon). Estimates of present rates vary from \$55 to \$82 per ton.

Distributing companies' profit allowance should be reduced from 4 to 3 cents per gallon, and retailers' profit from 10 to 8 cents.

Retail prices should be fixed by the government for periods of three months.

The output of benzol has fallen considerably since the armistice. The National Benzol Association has regulated the price to conform with that now charged for petrol.

Suggest League of Nations' Action

The members of the League of Nations should take joint action for their mutual protection against exploitation.

The only ultimate solution of the problem is the production of home and/or empire produced power alcohol under government encouragement and effective control.

The Board of Trade should fix wholesale and retail maximum prices for petrol in this country.

At present No. 1 petrol should be retailed at 2s. 10½d. (69 cents) per gallon, and No. 3 at 2s. 8½d. (65 cents).

The price of benzol should be fixed at 2s. 8d. (64 cents) per gallon, the garage allowance being reduced from 5d. to 4d. (10 to 8 cents) and its export should be prohibited.

Denby Acquires Control of Fulton

Long Island Truck Company
Sold at Receiver's Sale
for \$290,000

NEW YORK, March 12—At the auction sale to-day conducted by the receiver, stockholders of the Fulton Motor Truck Co. of Farmingdale, L. I., combined with Garvin Denby and other financial interests, purchased the factory and property for \$290,000.

A new company, to be known as Fulton Motors Corp., and to be headed by Denby, who was president and general manager of the Denby Motor Truck Co. of Detroit before its reorganization a year ago, is being formed with Denby as president and general manager. It is announced that the capital of the new company will be \$1,500,000 of Class A stock at \$10 par value and \$350,000 of Class B stock of no par value. Through ownership of a majority of the Class B stock Denby will have control.

It is the intention of Denby to continue the manufacture of the Fulton truck as at present designed and to shortly add some larger heavy duty models. All of the company's dealers are to remain in the organization, and old contracts will be renewed, while, in addition, large export orders are said to have been offered.

The production, which practically stopped when the plant went into the receiver's hands, is to be started again immediately. The receiver had retained a majority of the working force so as not to disrupt the organization, and there are large quantities of material on hand.

An election of officers of the new Fulton company, a Delaware corporation, is scheduled to be held in a few days. While it is not possible at this time to give more than the name of Garvin Denby as president, it is stated that all of the directors will be motor truck men with an individual interest in the company, and who will be heads of the various departments.

The bidding at the sale to-day was spirited. It started at \$25,000 and rose rapidly to \$200,000. After that it became a dual between the representative of an exporter, who is said to have been looking for an Eastern source of supply, and H. M. Hackett, president of the Denby Motor Truck Co. of Canada, representing Denby's interests and the stockholders.

TO PROBE TRUCK PURCHASES

WASHINGTON, March 12—A resolution has been introduced in the House of Representatives inquiring whether the War Department has contracted for or purchased military motor trucks or tractors, parts for them, and if so, the quantity. The resolution also asks how many of these trucks or tractors are available, the authority or law under which they were purchased, how many other trucks or tractors held by the War Department are available and the numbers of trucks and tractors which were sold by the War

Department or its agencies abroad, in Europe or this country. Inquiry is also made as to whether or not purchases of military trucks was disapproved by any branch of the War Department.

The resolution was introduced because during the debate on a resolution authorizing the transfer of motor vehicles by the War Department to the Bureau of Public Roads and other Government bureaus, it was discovered, it is claimed, that seventy military trucks, valued at \$8,000, were purchased within the last few months by the War Department.

Belgium to Show Cars During Olympic Games

PARIS, Feb. 18 (*Special correspondence*)—The first Belgian post-war automobile show will be held at Antwerp from May 15 to June 13, on the occasion of the Olympic games. The exhibition will be open to all types of passenger cars, equipment, wheels, forgings and castings.

From June 24 to July 25 the exhibition will comprise trucks, tractors, stationary engines, motor boats, and aviation engines. These two exhibitions are officially recognized by the manufacturers' associations of Belgium and France. Entries can be received up to March 1, and the drawing of lots for positions will take place on March 15. The price of stands is 300 francs per square meter, the stands having a uniform area of 40½ meters. This price is inclusive.

Cable entries from America addressed to the "Comité des Fêtes, 21, rue Arenberg, Anvers," will be accepted.

AUSTRALIAN REGISTRY, 55,459

NEW YORK, March 12—The Motor Traders Association of the Commonwealth of Australia gives the total number of motor vehicles in the Commonwealth at 55,459, divided between the States as follows:

	Cars and lorries
New South Wales.....	23,373
Victoria.....	16,207
South Australia.....	8,512
Queensland.....	2,506
West Australia.....	2,023

WILL RETAIN AVIATORS

WASHINGTON, March 12—Despite reports that have been circulated, Major General C. T. Menoher, director of the Air Service, has never at any time said that the 1349 officers of the Air Service would be either demoted or dropped from the service, according to a statement made by him to-day.

"However," the director says, "in order to reduce the number of Air Service officers stationed in Washington it has been found necessary to transfer some officers to flying fields and other Air Service stations in the different parts of the United States."

French-Moroccan Air Service Started

Passengers and Mails Carried on
Regular Schedule in Thirty-
Hour Trip

WASHINGTON, March 12—A commercial Aerial Transportation Company has been incorporated under the name of "Lignes Aeriennes Latecoere," and has established a commercial air line running from Toulouse, France, to Rabat, Morocco, according to information received by the Air Service. The machines leave France at 9 a. m. and arrive at Morocco in the afternoon of the following day.

Ordinary and registered mail for western Morocco may be sent in this way. French official mail between France and Morocco goes by this route. The average passenger and freight carrying capacity of airplanes traveling this route is approximately 1100 lb. This does not include the pilot and fuel for about 5½ hr. flight.

Charges in addition to the regular postal rates may be covered by the ordinary postal stamp, and mail marked "by airplane from Toulouse to Rabat" is accepted at all post offices. The company operating this line is subsidized by the French Government by an allotment of 10,000,000 francs to cover a period of fifteen years for the purchase of new equipment, and an additional subsidy of 4,000,000 francs has been granted by the Moroccan Government for the same purpose. The representatives of the company state that the financial condition of the company is satisfactory.

The airplanes which first started the service were Breguet biplanes with 300 hp. Renault motors. The company is substituting a new type plane which will carry two passengers, equipped with the Salmson 250 hp. motor. This company is maintaining regular service in all weather conditions since organized. The pilots are all reserve officers of the French aviation, their average pay being 20,000 francs a year. The mechanics are all demobilized from the Army Air Service.

No stop is necessary at the international frontiers, the customs inspection being made at the first authorized stop in the country. A great deal of interest is attached to this line due to the fact that it operates over greatly varying and exceedingly difficult country with uniform success. Not only are weather conditions very changeable in Spain, but the country offers practically no ground suitable for forced landings. In addition, violent and changeable winds are experienced over the Straits and the northern part of Africa.

HAVANA SERVICE STARTS

WASHINGTON, March 12—The first airplane service between Palm Beach and Havana was inaugurated March 2 with the arrival at Havana of a seaplane carrying passengers. The flight was made in 2 hr. 55 min.

Engines and Boats Shown at Olympia

Many American Models to Be
Displayed in Competition
With European Designs

LONDON, March 12 (*Special correspondence*)—The Society of Motor Manufacturers and Traders, Ltd., will hold a show of marine motors and boats at Olympia from March 12 to 20 in collaboration with the Ship and Boat Builders Association, Ltd., and the British Electrical and Allied Manufacturers Association. There will be exhibits from the United States, France, Sweden and Denmark, and possibly Italy, besides Great Britain.

There will be engines from 2 hp. with single cylinder to 500 hp. with 18 cylinders. The boat exhibits will range from pleasure skiffs to fishing boats and lifeboats of the sort which the Board of Trade insists on all passenger ships carrying a supply of.

A comparatively new sort of exhibit will be a "knock down" boat, which consists of frames previously erected and fitted, after which each part is taken down and packed in a very small compass and crated for shipment to any part of the world, all that is left for the purchaser to do being to reassemble the parts and planking, which latter is also supplied ready sawn and cut to shape. By this system boats can be supplied to builders and amateurs at considerably less cost than would be possible if each boat were designed separately.

One firm has no less than 40 designs, ranging from an 18-ft. launch to a 65-ft. cabin cruiser or freightboat. Boats of

this sort are doing service in India, Australia and other parts of the globe, where the services of naval architects, designers and skilled boat-builders are not available. Also a new system of skiff-building will be shown on the "knock down" principle.

The electric exhibits will include a variety of house and possibly farm lighting plants, of which importers of American sets have the means for a big and interesting display.

FORD DENIES TOLEDO RUMOR

DETROIT, March 12—Another Ford story, to the effect that the Detroit manufacturer was planning to build a huge tractor plant in Toledo, was denied at the offices of the Ford Motor Co. The report was that Ford had purchased 800 acres in Perrysburg, a Toledo suburb. Frequency of stories of new plans of Ford have compelled the installation of what might be termed the "no" department. Hardly a day passes, according to Ford officials, on which they are not called upon to deny stories of new ventures.

GARFORD TO AID OWNERS

LIMA, OHIO, March 12—The Garford Motor Truck Co. has established a new department, the duties of which will be to gather information on the operation of motor trucks and to aid owners in obtaining the lowest cost per ton-mile.

It will be known as the transportation engineering department, and will be in charge of the transportation engineer, whose experience with motor trucks and with haulage problems is extensive. The department will investigate the operation of Garford trucks in all parts of the country, obtaining data relative to the operating costs and actual service.

Car Makers Present Views on Shipping

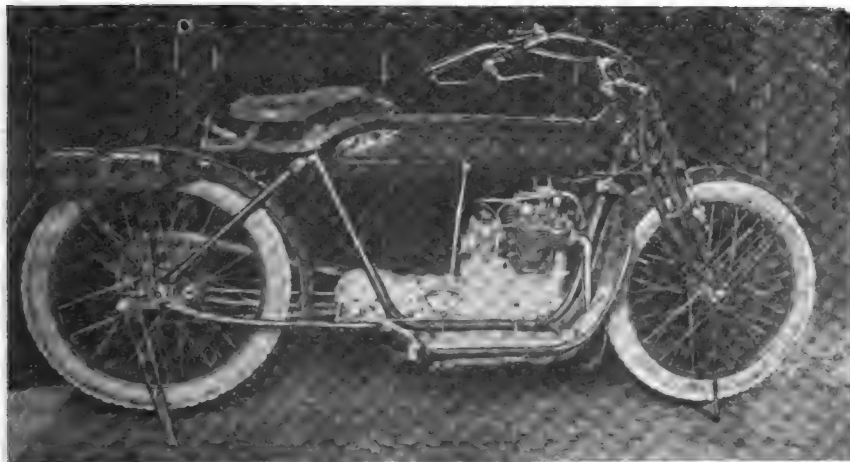
Requirements from Railroads Discussed at Meeting with Car Service Division

WASHINGTON, March 12—Representatives of the traffic departments of a number of the large automobile companies, headed by J. S. Marvin, general traffic manager of the National Automobile Chamber of Commerce, conferred with representatives of the Car Section Commission in Washington, Wednesday, over the car shipping situation.

During the past two years freight cars have not been restricted as to routing according to ownership. The heaviest production comes from the Michigan-Toledo zone, and A. H. Smith, at that time eastern regional director, placed an official at Detroit to supervise the distribution of automobile cars.

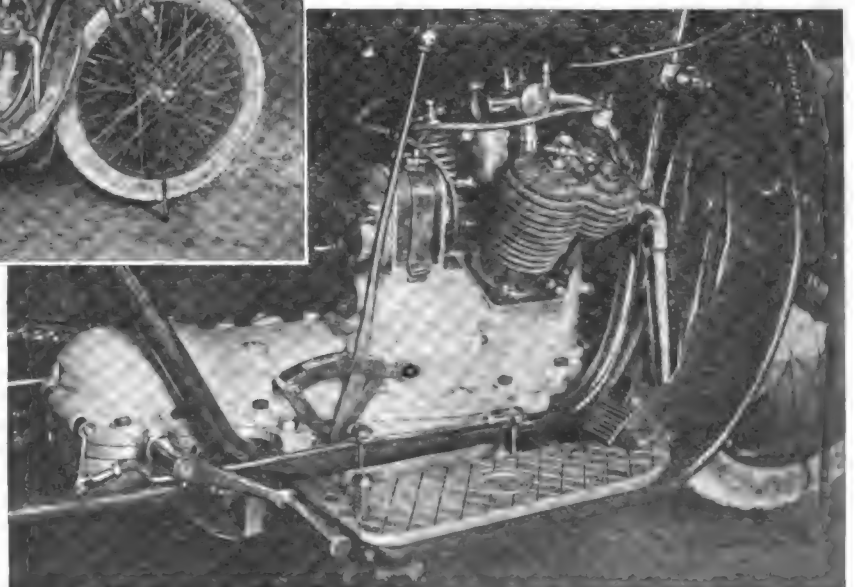
The change from Government to private control naturally changes this policy, and it was with a view to obtaining rules and regulations covering the subject that the meeting was held. No formal action was required, the meeting being a general discussion of the points involved in these changes.

Those attending the meeting were: A. H. Brown, Nordyke-Marmon; C. R. Scharff, Chevrolet; George C. Conn and A. H. Merrick, Buick; E. A. Hodge, Hupp; W. R. Short, Studebaker; George Main, Cadillac; F. H. Thompson, Willys-Overland; W. G. Dibble, Hudson; J. H. Myler, Maxwell; J. S. Marvin and Pyke Johnson, National Automobile Chamber of Commerce, and Commissioners Kendall, McGarry, Barnes and Nelson.



New Brevets Spring Motorcycle Has Automobile Type Power Plant

The Brevets Spring motorcycle made its bow at the Belgian show recently. It was built at Liege, and it is declared that one of the British motorcycle firms has secured the rights to build it. The power plant comprises a twin cylinder air-cooled V engine of 65 x 75 mm. bore and stroke, disk clutch, three sliding gears and bevel drive to cross shaft. Power is transmitted to the rear wheel by chain



Industry Gets 24,000 Cars in February

Shipments in Month Exceed February, 1919, by 5,000—Overland Deliveries 22,000

NEW YORK, March 12—Reports of automobile shipments reaching the National Automobile Chamber of Commerce recently indicates that more than 24,000 carloads of machines were shipped in February, as compared with 19,152 carloads in February, 1919. Notwithstanding the adverse shipping conditions, these figures exceed any previous record for the month of February. In addition to these more than 22,000 machines were driven overland.

At Washington on March 1, when the car service section started business as a branch of the American Railroad Association, the Chamber again presented the question of how automobile cars are to be handled when Federal control ceased. All special arrangements on such as coal cars and automobile cars were supplanted by car service rules, the underlying principle of which is that each road is entitled to have its own cars returned to it. The commission is authorized to suspend or permit departure from the car service rules or to exempt when necessary cars of any type.

The automobile situation is very active before them and they agree to name an early date for a conference with the N. A. C. C. to determine what can be done to assist the industry. In the meantime to take immediate advan-

tage of competitive influences, the Chamber has telegraphed the traffic heads of Western and Southern lines the imperative need of sending automobile cars into the manufacturing territories, asking that they advise the Chamber of their action.

The responses indicate that the lines are being checked with a view of loading automobile cars and getting them into service. The traffic department of the N. A. C. C. is co-operating in every way.

TO DESIGN CHASSIS

NEW YORK, March 12—The Chassis Lubricating Co., Inc., of New York, which was organized recently, is co-operating with engineers in working up designs for particular chassis, incorporating the Myers magazine oiling system, which was shown on several makes of trucks at the New York show. The invention is the product of Cornelius T. Myers, and provides a magazine oiling system for spring bolts and springs, consisting of hollow shackles and brackets. It provides a two months' oil supply, which is fed by capillary attraction, only when the truck is in motion. The system prevents moisture and dust from getting into the pin bushings.

SELDEN PRICES GO UP

ROCHESTER, March 12—Increased prices on all models were announced by the Selden Truck Corp. of Rochester, effective to-day. The changes are as follows:

1½-ton "Selden Special"....	\$2,240	\$2,460
2½-ton Model 2½ A.....	3,290	3,550
3½-ton Model 3½ A.....	3,990	4,325
5-ton Model 5 A.....		5,770

Gasoline Unchanged in Year, Tests Show

Government Reports Little Variation in Quality Shown in Countrywide Samples

WASHINGTON, March 12—Gasoline and motor fuel, as marketed throughout this country, has changed but slightly during the twelve months just ended; according to a report made public by the Bureau of Mines, as a result of investigations between Jan. 17 and Feb. 3. Eighty-one samples of fuel were collected by representatives of the Bureau, in Washington, New York, Pittsburgh, Chicago, New Orleans, Salt Lake City and San Francisco, the samples being taken in such a way that they represented the commercial output then being marketed in those districts.

"The Bureau of Mines, on studying these surveys, concludes that on the whole there has been little change in the nature of the motor fuel marketed throughout the country in the period from April, 1919, to January, 1920," the report states. "Refiners should take more care in some cases to avoid an excess either in the use of casinghead gasoline or of heavy naphtha."

A similar survey had been made in April of last year. Future work of the Bureau contemplates that such investigations will be made hereafter in January and July of each year. Details of the report follow:

"It will be noted that, while there have been some changes in the gasoline supplied to the individual cities, nevertheless, the general average of the January, 1920, survey is almost identical with the general average of the April, 1919, survey. The only noticeable difference will be found in the end point, which has risen 10 deg. since 1919. In other words, there has not been as much change in the last nine months as might have been expected, when the great changes that occurred in past years are taken into consideration. At the ninety per cent and dry points the average gasoline is very close to the specification.

Too Much Casinghead Gasoline

"When taking up the individual samples, however, several points must be noted. In a number of instances it was found impossible to recover 95 per cent of the sample in the receiver when using a mixture of ice and water in the condenser bath. This indicates that the sample contains an excess of low boiling fractions, which is probably due to an admixture of 'casinghead' gasoline.

"On the other hand, there are a number of samples which are above the specification at the upper part of the distillation range. When this occurs it indicates either that the refiner did not use modern tower stills, or that an excess of high-boiling naphtha has been used in blending. These samples when used in the average motor car would be apt to cause excessive carbonization, and also dilution of the crankcase oil."

This German War Tractor Found a Civilian Job



The business of beating the sword into a plow-share continues. This illustration shows the most powerful tractor that in wartime pulled the heaviest German bombardment guns converted into a tree-pulling machine. It uproots the heaviest trees and is a great time-saver

Ontario Adds 1402 Miles to Road Work

Good Roads Enthusiasts Hear Inspiring Reports at Annual Convention

TORONTO, March 12—Much to the satisfaction of the trade and industry that has done so much to this end the good roads movement is moving on to a flood that will carry all before it in Ontario. That fact was demonstrated last week in Toronto at the road conference for county road superintendents and engineers held in the Provincial Parliament Buildings, and at the annual meeting of the Ontario Good Roads Association held in the York Municipal Buildings. It was estimated that between five and seven hundred road builders and enthusiasts from the province attended the two conventions, which were highly successful.

Another important factor to be noted of road conferences is the fact that during the week announcements made by the Minister of Highways were more definite than at any time since he assumed office last fall. He announced that the route of the trans-provincial highway from London to Windsor would be via both the Talbot and the Longwood Roads, a decision which has been under consideration for over a year.

The big feature of the week's announcement was the designation of additional roads to the trans-provincial highway system, whereby 1402 miles are added to the existing 422 miles, making a total of 1824 miles of provincial-owned highways (in addition to county, township, municipal and market roads).

It may be roughly estimated that the cost of constructing this mileage in the next five years will be about \$23,000,000.

Since 1914 road construction in Ontario has not been very active on account of the war. While last season was the first year of peace the spirit of carrying out the good roads movement was not generally apparent owing to unsettled situations, yet over \$6,000,000 were spent on roads in this province. But this year promises to see by far one of the greatest road construction programs ever started in the 37 counties of Ontario and along the trans-provincial highway system. The trend of the times has awakened the road builders of this province to the necessity of building roads in all sections of the province, and the movement is being pushed forward with great enthusiasm and confidence.

Would Increase License Fees

A resolution favoring increasing motor license fees as a method of raising money for highway improvement purposes was passed. The convention recommended that the Highway Act be amended to permit road commissions to spend road money for tree planting along the highways.

L. E. Allen of Belleville succeeds K. W. McKay of St. Thomas as president. McKay and C. R. Wheelock, of Orange-



Police Aviators Guard Against Airplane Smugglers

Smuggling in airplanes has become a very profitable trade in Holland, Germany and Spain. This photograph shows German police aviators examining packages carried by a flier. All airplanes arriving in Germany are carefully watched

ville, another past president, were made honorary presidents of the association. Other officers elected were: Vice-presidents, T. J. Mahoney, Hamilton, and W. H. Brown, Cheely; secretary-treasurer, Hon. Geo. S. Henry, Todmorden; directors, F. A. Senecal, Plantagenet; J. A. Sanderson, Oxford Station; William Nugent, Belleville; W. H. Pugsley, Richmond Hill; Major T. L. Kennedy, M.P.P., Dixie; J. E. Jamieson, Singhampton; John Currie, Strathroy; J. E. Watters, Niagara-on-the-Lake, and S. L. Squire, Toronto.

SCHOFIELD TO MAKE TRACTOR

TORONTO, March 12—The Schofield Tractor Corp., Limited, has been incorporated under the Ontario Companies' Act, with an authorized capital of \$1,000,000. The head office will be at Toronto, Ont. The company has acquired from the Orillia Tractors, Limited, the Canadian rights for the Schofield Automotive Tractor. They have secured factory accommodation on Dufferin Street, and are now getting the necessary machinery. They expect to be in production with a few months.

MAKES OLD TIRE PRODUCTS

INDIANAPOLIS, March 12—The Rub-Tex Products, Inc., has been organized with \$750,000 capital to manufacture automobile floor board mats, running board material, pads, spring and body bumpers, windshield, fan belts and other automotive equipment in the rubber line, and has leased a local manufacturing plant. The Rub-Tex process which was developed by Louis E. Klug, general manager of the new firm, utilizes old tires.

German Magnetos Bid for Markets

British Makers Fear Sweeping Away of Business with Trade Resumed

LONDON, Feb. 27 (*Special correspondence*)—Sir Auckland Geddes, who, it is said, is to be British Ambassador to the United States, at a luncheon tendered him by the Association of Weekly Trade and Technical Journals, advocated the resumption of trade with Germany to restore credits and bring exchange to par value. He expressed little fear of the effect of competition upon British industry.

(So far as the motor industry is concerned, the magneto, which is the chief competitive item facing the British manufacturer, cannot be imported except under license, and, as already there are calls for the German magneto for British engines, the future looks blank for the half a dozen British makers' magnetos which the war's needs called into being.)

S. F. Edge stated recently that German magnetos are being offered upon the British market at \$10 each, the British machine being priced at \$75, so that it is not to be wondered at that this invitation to trade with Germany is not relished by the British magneto makers

CHEVROLET PRICES RISE

NEW YORK, March 12—Chevrolet Motor Co. has advanced prices for all its passenger models \$60 a car, the new schedule being effective March 1.

Production Topic of C. C. U. S. Convention

Will Seek Means to Greater Output as Solution to Return to Normal Conditions

WASHINGTON, D. C., March 16—The eighth annual convention of the Chamber of Commerce of the United States, to be held in Atlantic City, April 27 to 29, will be made an "Increased Production Convention," in an effort to work out plans for the re-establishment of normal business and price conditions.

The general subject of increased production has been divided up in the program for the convention into sub-subjects. The first of these is the Government in relation to production. Under this heading will be considered anti-trust legislation and taxation.

Second of the general subjects will be transportation in relation to production. This will include both land and water transportation. One of the chief causes of lack of production, it will be pointed out here, is the general shortage of railroad equipment. International finance and its relation to world production has a prominent place on the program.

One general session of the convention will be given over to agriculture in relation to production. Another important general subject will be the relation of labor to production. This will be approached from both the side of the employee and employer. Group meetings in addition to the general sessions will discuss means to increase production.

Seek Information on British Import Tax

LONDON, March 5 (*Special Correspondence*)—The American Chamber of Commerce in London is sending a deputation from its motor group to ask the president of the Board of Trade what the future policy of the British Government will be as regards the 33½ per cent c.i.f. import duty at present imposed on imported passenger cars, the bulk of which come from the United States.

The duty is a temporary one, and, as emphasized by the Chancellor of the Exchequer last spring, can be imposed only if approved by the Parliamentary vote upon the budget each year. There are persistent rumors that the Government contemplates removing the tax with the introduction of this year's budget; on the other hand there are equally persistent rumors that the Government contemplates no such thing.

The American Chamber of Commerce in London, which represents in its automobile group practically the entire trade importing from the United States, has asked Sir Auckland Geddes to receive this deputation and throw such light as he can on the future position, in order that these Anglo-American traders may know where they stand and what to count upon.

If there is no possibility of the removal

of the tax, it is to be urged that it be assessed on an ad valorem basis instead of c.i.f. If, on the other hand, the tax is to be removed, the Government will be asked if it contemplates any arrangement for cars in the docks at the time of the removal.

The present 33½ per cent duty c.i.f. on passenger cars when added to the depreciated purchasing power of the pound sterling and the high freight rates, makes it impossible to sell an American car in Great Britain at much below double its American price. Commercial vehicles have been free of import duty.

EDGE FORMS NEW COMPANY

LONDON, March 2 (*Special Correspondence*)—The formation of the firm of Edge & Napier, Ltd., is announced today, the members of the firm being S. F. Edge, of the Napier car fame, and J. S. Napier. The latter member of the firm is in no way associated with the Napier Motor Co. but recently has been serving as an engineer and writer on motor technics. He was for some years associated with Arrol Johnston and later with the Humber Works, Coventry. The full plans of this firm have not been disclosed.

This news definitely corrects an item published in AUTOMOTIVE INDUSTRIES, issue of Jan. 15, in which it was stated that a rumor had it that S. F. Edge had joined the directorates of the Armstrong-Siddeley and the Auto Carriers, Ltd. Edge formed no such connection as then reported.

TO MAKE CARRICO GEARS

DETROIT, March 16.—The Carrico steering gear will be manufactured by the Steering Gear and Parts Co., which has exclusive rights to the manufacture of these gears. This concern owns a large plant at Detroit. Officers of the company are:

H. S. Hall, president, vice-president of the Lewis-Hall Iron Works and president of the Lewis-Hall Motors Corp., builders of Hall trucks. Henry B. Lewis, vice-president, president of the Lewis-Hall Iron Works and vice-president of the Lewis-Hall Motor Corp. Archibald Carey, secretary. The above, with F. D. Carrico, constitute the board of directors.

GETS AEROMARINE RIGHTS

NEW YORK, March 16—Sales rights for the planes of the Aeromarine Plane & Motor Co. of Keyport, N. J., for that territory in the United States west of the Allegheny Mountains have been taken over by Continental Aircraft, Inc., of Chicago. This announcement was made at a dinner in New York held in connection with the show of the Manufacturers' Aircraft Association. The Continental company is headed by Harry Newman, of Chicago, who is well known as a distributor of automobiles and airplanes in that city. Statements made at the dinner were to the effect that the sales company had contracted for a number of seaplanes to be sold for use on inland waters and on the Pacific.

Ford Gets Rights to Spanish Plant

Early Production Planned at New Assembly Station at Cadiz Free Port

WASHINGTON, March 15—The Ford Motor company has been granted authority by the Spanish Government to establish an automobile assembling plant within the zone embraced in the "Free Depot" of the port of Cadiz, Spain, according to a report received from the American Consulate office at Cadiz, by the Bureau of Foreign and Domestic Commerce.

The company has already shipped considerable machinery and is commencing installation and expects to start assembly in the near future.

Cadiz is commonly spoken of as a "Free Port," but in its entirety, it is not that. It does, however, possess a "Free Depot" zone, embracing certain of its harbor facilities; a concession from the national government that no other Spanish port now possesses. In effect, imported goods can be landed in this specified zone without immediate payment of customs duties; and for such goods as are re-shipped to other countries, no duty whatever will have to be paid. If these goods are distributed in Spain, they must pay the regular duties.

The Ford company proposes to utilize this right. Such of its cars as are put up here and then shipped to other countries, like Portugal, or to those in Africa, will be freed of Spanish customs duties. Only those that are marketed in Spain or in its colonies, will be liable for duty.

The ownership and operation of a plant of this kind, so advantageously situated as regards customs duties, will permit of great savings in the way of ocean freight. The present rule is to bring in cars here that have already been set up, and then crated, which necessarily demand a great amount of space on board vessels, which has to be paid for, and at the prevailing high rates of freight, at so much per cubic foot.

The company will be able to avoid doing this, and instead bring the cars in parts, in compact bundles, that will utilize the full carrying capacity of a vessel. The saving of the crating expense alone is no inconsiderable item. All of these savings will result in a very great lessening of the present selling price of the Ford car, and it will be placed within the reach of many more purchasers. It is expected that the export of these cars from here, especially to countries in Africa, will become a considerable total.

SPAIN CHANGES DUTIES

WASHINGTON, March 12—By a decision published in the customs bulletin of Spain, under date of Nov. 21, 1919, the top, lamps and horn of an automobile are to be dutiable separately under the corresponding tariff numbers, and not as a part of the automobile, according to a recent commerce report.

Olympia Truck Show Set for October

Will Precede Passenger Car—
Propose Also Separate
Body Exhibit

LONDON, March 12—The Society of Motor Manufacturers and Traders, Ltd., have decided to hold a truck show in Olympia during October. The actual dates will probably be prior to the 20th, to give time for clearance and preparation for the car show which will, in all likelihood, be held early in November.

Regarding the proposition of finding space for the exhibit of cars on the scale expected to be required, nothing so far has been decided by the society. The proposal, one of three alternative suggestions, to run a second exhibition at Olympia limited to body work and equipment has been balloted on with adverse results.

Certain sections of the trade are strongly opposed to a plan which suggests preferential treatment to the possible detriment of the coach-building trade, whose wares, it may easily be argued, are so valuable a factor of attraction to the car show.

ENGLISHMAN.

Oregon Wants Trucks for New Highways

PORTLAND, ORE., March 15—Oregon will be strongly in the market for motor trucks this year. This is already evidenced by orders placed with distributors, but behind that is the fact that the program of the State Highway Commission for road construction is greater even than last year, which was a banner road building season.

Already under contract for construction this year are a total of 816 miles of road, or 250 miles more than were built last year. This mileage is divided as follows: Paving, 212.7 miles; macadam, 207.9 miles, and grading, 392.3 miles. And this total will be considerably increased by contracts to be awarded by the Highway Commission this spring and summer.

Production Slow in French Plants

PARIS, March 1 (*Special Correspondence*)—Citroen to-day announced a further increase on the price of his car, bringing the selling price to 16,500 francs, or nominally \$3,300. This car was put on the market a year ago at 7,900 francs, or \$1,580. Citroen claims that most of his difficulties have been overcome and that he is now producing 60 cars per day. His original program called for an output of 100 cars per day by March, 1919.

Renault has decided to abandon his 10 hp. car which was first shown to the public at the last Paris Salon. It is understood that the first series of 1000

will go through the shops, but no more will be built. This car was announced soon after the armistice to be sold complete at \$1,700. With Renault's reputation back of it the car attracted much attention and many orders were received. The car is pure Renault design at the front end, but is closely based on the Ford at the rear end.

It is declared that the test models have not given complete satisfaction. Renault's cheapest model will be a 12 hp. car with 4-cylinder engine, 3.1 x 5.5 in. This is listed at \$4,600 complete with four passenger body. The car is practically the same as the pre-war type, with the addition of electric lighting and starting.

A loss of \$85,639 on the year's working is recorded by the Mors Automobile Co. of Paris. By drawing on reserves and war profits it was possible to convert this loss into a net profit for the year ending September, 1919, of \$759. Since the armistice the Mors factory has been principally engaged on work for the Citroen company. The losses are attributed to strikes, the 8-hour day, poor transportation, and the shortage of raw material.

AVRO TRIALS SATISFACTORY

LONDON, Feb. 28—(*Special correspondence*)—Trials of a new model Avro triplane, fitted with a Beardmore engine of 160 hp., have been completed satisfactorily at Hamble. The machine is said to have a low gasoline consumption, making at cruising speed of 80 m.p.h. about nine miles to the gallon of gas. A roomy and comfortable cabin has been fitted inside the fuselage, containing four seats, two facing each way. By removing the seats 113 cu. ft. of baggage space is obtained.

HENDRICK'S OFFERS REGISTER

NEW YORK, March 16—The new edition of Hendrick's Commercial Register, published by the S. E. Hendricks Co., Inc., has come off the press and is being offered as a buyers' reference. It is an annual register of manufacturers, dealers and consumers in the engineering, metal, contracting, mining, chemical, electrical, mechanical and similar industries. It contains some 2500 pages of names and addresses, giving several indices for the quick location of industrial names.

HAYES OPENS NEW PLANT

LINDSAY, ONT., March 12—The plant of the Dominion Wheel Co., which has been closed down for three years, has been re-equipped with machinery for the manufacture of truck wheels, passenger car wheels and special repair work on passenger car and truck wheels. It will be operated by the Hayes Wheel Co. of Canada.

PURITAN BUYS A. B. C.

DETROIT, March 7—The Puritan Machine Co. has purchased the A. B. C. Starter Co., manufacturer of electric starting and lighting equipment for Ford cars.

Detroit Not Scary of Steel Shortage

Fear That Railroads Will Com-
mandeer Market Ridiculed by
Car Makers

DETROIT, March 14—Reports that the automobile industry would be sacrificed by the steel manufacturers for the benefit of the railways are not taken seriously here. A rumor became current that the steel mills after July 1 would devote the entire output to the railways, leaving the automobile industry without any source of supply.

Representatives of steel companies in Detroit characterize the report as ridiculous, and automobile executives declared they felt no concern on that score. They contend that the railways will demand only steel rails and heavy plate, while the automobile industry uses lighter plate and bars.

Where the effect will be felt more seriously is in the structural and building trades, which, of course, will have some effect on the automotive industry, however, there is no fear that conditions will be as bad as in the early winter, when manufacturers scraped their plants to dig up every ounce of steel, and many of them were paying enormous prices, and in many cases premiums and bonuses for steel.

Conditions to-day are much better than they have been for some time, and will continue to improve, according to men conversant with conditions in the steel market, and who are at all times alive to every move likely to have an effect on the industry.

W. W. Raymond, of the Detroit Pressed Steel Co., F. J. Haynes, acting general manager of Dodge Brothers, and J. H. Main, purchasing agent of the Cadillac Motor Car Co., declared the steel crisis was passed some time ago, and looked for conditions to improve steadily.

Prices High in Market

At least two leading Detroit automobile manufacturers, unable to get sheets of automobile quality in open market have paid \$90 and \$92 in Pittsburgh for from 3000 to 5000 tons of prompt open-hearth sheet bars, which are being turned over to certain mills for conversion.

Most of the automobile factories caught when the shortage came in the winter, are accumulating a reserve wherever possible, despite the present high price, in order to safeguard themselves in the event of any emergency.

While the transportation systems of the country necessarily are considered as having first call upon the steel mills, automobile manufacturers contend that steel men will not permit them to suffer as a result of short sightedness on the part of Federal officials, who have permitted the railroads to deteriorate during the two years of Government control. They contend they will be taken care of, and while maximum output may not be reached there is little likelihood of any serious curtailment.

Gasoline Situation Shows Improvement

Supply in Reserve Greater Than
Last Year and Close to
Normal

WASHINGTON, March 12—In view of the reports of a shortage of gasoline and crude oil and the predictions of officials in the oil industry that gasoline would increase to as high as 35 cents a gallon, figures just made public by the Bureau of Mines, Department of the Interior, are particularly important. These show that the situation as regards gasoline is considerably better than it was a year ago. A total of 446,793,431 gal. of gasoline were on hand at the refineries, as of Dec. 31, 1919, compared with 297,326,983 gal. in 1918, and 412,256,833 gal. in 1917, displaying a recovery from the war time conditions.

Crude oil shows an alarming decrease in the stocks on hand and especially so in view of the fact that production has increased steadily during the last few years. The crude oil on hand as of Dec. 31, 1919, was 13,143,285 bbl., against 15,749,771 bbl. on Dec. 31, 1918, and 11,638,433 bbl. on Dec. 31, 1917. This shortage is particularly noticeable as production of crude oil has increased steadily with 1,046,052 bbl. per day in December, 1919, as compared with 869,618 bbl. per day in December, 1918, and 811,484 bbl. in December, 1917.

That there is a distinct decrease in the surplus of gasoline, despite the large amount on hand at present, is also shown by the fact that, with production at 10,827,729 gal. per day in December, 1919, the stock on hand at the end of the month totaled but 446,793,431 gal., while in 1917 a daily production of 8,027,311 gal. was combined with the stock on hand on Dec. 31, 1917, for a total of 412,256,833 gallons.

Lubricating oils show a slight decrease in stock on hand compared with a distinct increase in the daily production. Kerosene likewise shows a decrease in stock for Dec. 31 of each of the past three years against the constantly increasing daily production.

Tractor Study Class Opened in Buffalo

BUFFALO, March 17—Under an arrangement between Erie County Farm Bureau Agent E. Victor Underwood and the State College of Agriculture at Ithaca, a tractor school was opened at 135 South Elmwood Avenue, Buffalo, March 15, and will continue until March 19, inclusive.

The instructors from the college explaining the use of the tractors, men of actual farm experience, are F. G. Behrends and A. M. Goodman. Behrends explained Monday the types of tractors, drivers, lugs, the gas engine, cycle, general survey, distribution of weight, types of drivers, control and accessibility of parts.

At Tuesday's session he explained the theory of gas-engine timing, study of cooling, governing, fuel and ignition systems. Goodman made clear the cooling, governing, fuel and ignition systems in detail. To-day the students were instructed in ignition, high tension, motor construction, transmission and lubricating.

Thursday and Friday a study will be made of horsepower on tractor ratings, the timing of valves and ignition, fuels and carburetors, pulleys and belts and belt speeds.

Among the tractors in use at the school are the International, Titan, Cleveland, Case, Fordson, Moline and Bates' Steel Mule Thirty.

Ford Gasoline Street Car Under Inspection

DETROIT, March 12—Henry Ford's new gas car, which it is proposed to install on the new municipally owned street railway lines, if Mayor Couzens' bond issue plan carries, was inspected yesterday at the Ford plant. Mayor Couzens and members of the council saw the body mounted on the chassis, and were given all the details of construction and operation by C. E. Sorensen, Ford's general manager.

Sorensen said it would be a month and probably six weeks before the car would be ready for the test run to Chicago over the Michigan Central tracks. The city officials were much impressed with the car, and it is believed the Ford car will prove a material factor in the voting on the bond issue.

Detroiters' confidence in Ford and in Sorensen, and the fact that the new street cars are to be built at home, is expected in a great measure to determine the issue.

KLEIBER TO MAKE TRUCKS

ATLANTA, GA., March 15—Kleiber trucks are to be manufactured in Atlanta in a big truck plant to be established here immediately by Paul Kleiber of San Francisco. Edward Kleiber, his brother, is in Atlanta to superintend the construction of the plant. A site comprising four and a half acres has been purchased at Peters and Park streets in the west end, where the White Hickory Truck and Hanson Motor Co. plants are located. Construction work is to begin immediately on what will be one of the biggest truck manufacturing plants in the South. It will be completed and in operation in a few months, Kleiber stated.

BRITAIN SELLS ARMY TRUCKS

LONDON, March 2 (*Special Correspondence*)—The British Ministry of Munitions in a recent statement says 17,806 Government owned trucks have been sold for \$36,445,695, and 15,394 trucks continue under his control. This latter number includes trucks under repair at the Government works at Slough, near London, and others in use or stored in France and Germany.

Handley-Page to Build Small Plane

Plan \$1,000 Vehicle to Compete
With Motor Cars for
Pleasure Riding

LONDON, March 2 (*Special correspondence*)—The sudden termination of the war produced a bad slump in the British aircraft industry, and matters have gone worse since; one airplane maker after another having gone out of business or been forced to amalgamate with larger firms having "other strings to their bows."

Some British aircraft factories are building motor bodies, and some others are making furniture for much-needed houses. The Handley-Page Co. has in prospect a popular priced airplane, suitable for mass production and selling for not more than \$1,000. Such a machine as plotted by the company's experts is expected to compete for popularity with motor cars.

The engine will be of 25 horsepower, and the fuel supply will be sufficient for five hours at 110 miles an hour. The Austin Motor Co., Birmingham, was early in the field with a popular airplane, but the price is just double that of the proposed Handley-Page.

ENGLISHMAN.

NEW WESTINGHOUSE BATTERY

PITTSBURGH, March 12—The Westinghouse Union Battery Co., recently formed, has taken three floors of the factory of the Union Switch & Signal Co. at Swissvale, but is expected soon to erect a plant of its own upon ground adjacent to the Swissvale works. The initial capacity of the shops will have from 1200 to 1500 batteries a day, with a working force of about 500 employees.

A. L. Humphrey, president of the Westinghouse Air Brake Co., is chairman of the board of directors of the organization; D. F. Crawford, vice-president and general manager of the Locomotive Stoker Co., is president, and T. S. Grubbs, vice-president of the Union Switch & Signal Co., is also vice-president of the new company, while T. R. Cook, one of the oldest battery construction engineers in this country, is vice-president and general manager.

TO START INDIA SAILINGS

NEW ORLEANS, March 14—Inauguration of a steamship service between New Orleans and India, with the first vessel to sail April 15, has been announced by M. H. Tracy & Co., steamship agents. The vessel will be a steel steamer and the rates in connection with the service and the ports of call for general cargo are: for Karachi, Bombay, Colombo and Calcutta, \$1.10 per 100 lb. for all cargo stowing under 40 ft., and 70 cents per cu. ft. for cargo stowing 40 ft. or over; for Madras and Rangoon, \$1.30 per 100 for cargo stowing under 40 ft. and 75 cents per cu. ft. for cargo stowing 40 ft. or over.

Strike Reaction Seen in England

Car Makers Turn to Drop Forging Methods to Supplant Castings

LONDON, Feb. 21 (*Special Correspondence*)—One of the results of the late molders' strike is seen in the marked interest in substituting press work for castings. The idea is that this step will enable non-union and unskilled workmen to be employed on work which at present is limited to more skilled workmen.

The E. W. Bliss Co., makers of giant presses, have a large number of big orders for presses for British motor firms, this despite the marked adverse rate of exchange. To illustrate this—a \$50,000 press is now quoted here at \$65,000 and the fact that this machine cannot be installed in time to be of much economic service to the present season's production is not considered.

Another significant sign of the times is that many British motor firms are not only looking more favorably to co-operative purchases of materials, etc., but of pooling mutual interests without sacrificing the distinctive features of any make. This step is being promoted by the Association of British Motor & Allied Manufacturers.

One more cosmopolitan trade body, the Society of Motor Manufacturers and Traders, Inc., has been formulating an internal code for the British motor trade, the details of which are nearly completed.

Another effort toward coordinating output costs has standardization for its aim, and the latest instance of it is the action of the British Machine Tools Trade Association in asking the British Engineering Standards Association to arrange a conference to discuss standardization of gears. In a note from that body reference is made to similar efforts and attention being given in the United States to this item of standardization.

It is hoped to formulate a plan as a basis for some scheme of mutual value. Accordingly, the conference asked for is to be held soon in the Institution of Civil Engineers' Hall.

ENGLISHMAN.

Charge Three With Unfair Competition

WASHINGTON, March 12—Complaints have been issued by the Federal Trade Commission against the National Wire Wheel Works, Inc., the Vacuum Oil Co. and the Valvoline Oil Co.

The National Wire Wheel Works, Inc., Hagerstown, Md., has been cited to answer a complaint of unfair competition in the manufacture and sale of wire wheels for automobiles. The company has forty days in which to file answer, following which the case will be set for trial. The complaint alleges false advertising by the company in holding out

to the trade and the public that its products possess certain exclusive patented features.

The Vacuum Oil Co., New York City, has been cited in a complaint of unfair competition in the manufacture and sale of petroleum and its products, the company, it being alleged, giving rebates or accumulated discount to cause purchasers to confine their purchases exclusively to the company's products. The company has forty days in which to file a reply.

The Valvoline Oil Co., New York City, it is alleged, leases its devices and equipment with the understanding that the lessee will not use competitive oils or gasoline in the oil pumps, storage tanks and equipment which the Valvoline company leases. This concern has forty days in which to file a reply.

Siemens-Schuckert Develops New Plane

WASHINGTON, March 12—The German airplane company, Siemens-Schuckert, has sent one of its expert aviators to Stockholm, Sweden, to demonstrate a new type of Siemens-Halska biplane, according to a report received by the Air Service.

This machine is patterned after the scout type used by Germany during the war. It is equipped with a 240 hp. rotary Siemens-Halska motor. One of the peculiarities reported concerning the performance is that while the motor is running with the greatest number of revolutions, the propeller revolutions give double the r.p.m. of the motor, while another point is that the motor loses none of its effectiveness at great heights. This machine is capable of ascending 6000 meters in 15 min.

The machine has received great praise in Stockholm and is said to be especially adapted for couriers, police, customs work and sport.

BRITAIN AIDS AIRMEN

WASHINGTON, March 12—That the British Government is taking active steps to encourage civil aviation is shown by the recent announcement placing Hounslow airdrome at the disposal of civil air pilots and civil aviation concerns and by its more recent announcement that the Hounslow airdrome has been equipped for night flying for the convenience of civil aviators.

The airdrome is so operated that it flashes signals at night at a lighthouse, giving three flashes every 10 sec. and also operates ground searchlights and landing flashes. The flashes and searchlights will be operated when the airdrome is notified that machines intend to land or when airplanes are heard in the air.

HUDSON-ESSEX PRICES

DETROIT, March 13—New prices for Hudson and Essex cars have been announced as follows: 4- and 7-passenger Hudson phaetons, \$2,400; Hudson sedan, \$3,200; Hudson coupe, \$3,375; Hudson touring limousine, \$3,725; Hudson limousine, \$4,075; Essex touring car and roadster, \$1,545; Essex sedan, \$2,450.

N. A. C. C. Requests Lower Car Tariffs

Would Encourage Imports as Trade Stimulus and Remove Prejudices Abroad

NEW YORK, March 12—The automobile industry, through the National Automobile Chamber of Commerce, has asked the Government to lower the import duty for its foreign competitors. The action was taken at a members' meeting of the Chamber in New York to-day at which it was announced that a canvass of 123 member companies had resulted unanimously in favor of the reduction of the tariff on imported cars costing \$2,000 or over, from 45 per cent to 30 per cent.

A memorandum has been sent to the Tariff Commission at Washington setting forth the reasons why such action is felt to be in the interest of the industry as well as business generally. The industry believes that the encouragement of importation should prove helpful to the present serious exchange situation, and is not to be feared by a home industry of the size and strength of automobile manufacturing.

It is pointed out that prejudice is bound to persist against the American product in foreign markets while our tariff is held at its present high rate, and that the outcome would be a disposition on the part of other automobile manufacturing nations to retaliate with equally high tariffs, probably discriminating against the United States. It is hoped that, it being the avowed wish of the industry to have the duty lowered, Congress may be persuaded to consider a downward revision of this item at the present session.

The makers appreciate that a lower duty will bring in more foreign cars, but rather welcome the competition as a stimulus to continue America's leadership in all types of motor cars. This country now produces 85 per cent of the world's supply of motor vehicles.

There also was an expression of gratification at the meeting that the House has defeated the proposed withdrawal of the foreign commercial attaché service, so much needed in the export trade, and that, instead, the Department of Commerce is to be accorded an increased appropriation for an extension of its very valuable work of investigation in foreign fields.

GEMCO TO DOUBLE OUTPUT

MILWAUKEE, March 13—The Gemco Mfg. Co., 742 South Pierce Street, Milwaukee, is erecting a 2-story plant addition, 50 x 170 ft., which will enable it to increase its output of bumpers, windshields and other automotive equipment about 50 per cent, equivalent to \$2,000,000 per annum. The enlargement is made necessary by a marked increase in export demand from South America, Philippine Islands, Java and Mexico, as well as from domestic sources. The output is distributed through jobbers only.

Tax Decrease Swells**Kelly Tire Surplus**

SPRINGFIELD, MASS., March 12—Reduction of Federal tax requirements in 1919 result in an increase in the surplus of the Kelly-Springfield Tire Co., over 1918, according to the annual report of the company recently issued. Actual net profits for the year were lower than in 1918.

Gross profits for the year were \$7,034,284, as compared with \$7,187,834 in 1918. This was ascribed to increased manufacturing and other costs rather than to any falling off in business. Operating expenses of \$3,776,735 were more than a million higher than in 1918, so that net profits before Federal taxes last year were \$3,532,088; \$1,057,677 lower than the \$4,589,765 for 1918.

Federal taxes on 1919 were only \$814,275 or less than one-third that item in 1918, which was \$2,657,492. For this reason surplus after all charges in 1919 was \$2,422,522 compared with \$1,707,735 in 1918.

SHERARDIZING FIRM TO MOVE

NEW HAVEN, CONN., March 12—The New Haven Sherardizing Co. will shortly remove to Hartford where a larger and more adequate plant has been secured which will provide good shipping facilities. The concern is engaged in the process of dry galvanizing metal parts to prevent rust. The business was begun in 1910 under English patent rights and was developed largely with Hartford capital. The company makes a specialty of mandrels for the manufacture of automobile inner tubes and is doing business with over 200 tire companies in the United States and Canada. The company also designs and installs small plants for manufacturers for treating their own products. Edwin Y. Judd is president of the company; Judson H. Root, vice-president; Wesley I. D. Charter, treasurer, and John F. Forward, secretary—all of Hartford.

KARAVAN BUILDS TRUCK

PORTLAND, ORE., March 15—The Karavan Motors Co. has been organized in Portland for the manufacture of a heavy duty motor truck to be known as the Karavan. Several of the trucks have been built and are in operation. The factory and assembling plant is at the Hesse-Martin Iron Works. While the Karavan is an assembled truck, such parts as the frame cross members, aluminum castings for radiator core, and hub caps are made here. The units used in the truck include Buda motor, Brown-Lipe transmission and clutch and Sheldon worm drive and axles.

E. D. Van Dersal, for the past ten years a motor car and truck salesman, dealer and distributor in Portland, is president of the Karavan Motors Co.; Fred Hesse, of the Hesse-Martin Iron Works, vice-president and consulting engineer; Whitney L. Boise, secretary, and George H. Peters, engineer in charge of construction.

**Current News of
Factories****Notes of New Plants—
Old Ones Enlarged****Keystone Truck Takes
Over Commercial Car**

PHILADELPHIA, March 12—The Keystone Motor Truck Corp. has been organized to manufacture automobile trucks and, among other things, has taken over the assets of the Commercial Car Unit Co., Philadelphia.

The corporation has the following officers: H. B. Harper (of the Overland Harper Co.), president; M. S. Cooper (formerly manager commercial car division, Willys-Overland factories), vice-president in charge of sales; C. W. Binns (formerly secretary and treasurer of the Commercial Car Unit Co.), treasurer, and Allan N. Mann, secretary. The following directors have been elected: J. Kearsley Mitchell, H. B. Harper, M. S. Cooper, P. I. Harper and A. E. Nash.

The corporation has acquired a property at Oaks, Pa., having both Pennsylvania and Philadelphia & Reading Railways connections, and is completing its factory buildings, which should be ready for occupancy April 1. Headquarters will be in Philadelphia.

The present production of one and two-ton Keystone models has been sold ahead until May 1, at which time increased facilities will permit immediate deliveries on both models to be made.

FORM NEW TRACTOR COMPANY

EAU CLAIRE, WIS., March 12—The Inland American Tractor Co. has been organized in Eau Claire, Wis., by members of the R. D. Nuttall Co., Pittsburgh, manufacturing gears, supported by St. Paul and local capital. It is hoped to start production of a four-bottom tractor, known as the "Cata Gripper," by July 1, for early fall deliveries. A. A. Robbins of St. Paul will be president of the new company. R. D. Nuttall, president; Milton Ruppert, vice-president, and Lester H. Keim, general manager, respectively, of the Nuttall company, are among the principal stockholders. Eau Claire capital is represented by R. B. Gillett, Edward Hutchens, J. B. Hubbard, A. P. Hensen and R. L. Meader.

JOBGING FIRM ORGANIZED

NEW YORK, March 12—A. S. Flanagan, who has been 15 years with Charles E. Miller, 97 Reade Street, jobber of automotive equipment, and W. A. Pendersen, also with that firm for many years, have resigned and organized the P. & F. Auto Supply Co., with temporary headquarters at 35 Warren Street. They are entering the general jobbing, exporting and wholesale business, and are soliciting catalogs.

Bosch Institutes**New Welfare Policy**

SPRINGFIELD, MASS., March 12—According to announcement made this week, employees of the American Bosch Magneto Corp. of this city will receive a \$500 life insurance policy, in addition to sick benefits. Sick benefits will range from \$9 to \$20 per week, according to wages received by those who have been in the service of the corporation continuously for 60 days, or more. An additional \$100 will be added to the insurance policy until the maximum of \$1,000 is reached.

The association is to be governed entirely by employees with their own executive committee into sick and auditing committees, which will investigate and adjust all claims. In addition to the first aid treatment, the company has arranged to provide the services of a physician, dentist and nurse for families of employees. The work has already been started and has proved effective in the care of families in which members are ill with influenza.

High Costs Suspend**Work on Tractor Plant**

JANESVILLE, WIS., March 12—The General Motors Corp., on March 1, ordered building operations at its Samson Tractor Co. works in Janesville, Wis., stopped indefinitely because of the scarcity and high price of labor, the scarcity and abnormal cost of materials, and the inability to induce adequate provision for housing accommodations.

According to J. A. Craig, president and general manager of the Samson company, the manufacturing program will be carried out with the existing facilities, representing an investment of \$7,700,000 and providing for the complete assembly of tractors. Work on the big foundry and additional machine shops will be resumed as quickly as harassing conditions are remedied and the construction of dwellings approaches more nearly the requirements.

TAKES OVER WHEEL SALES

BALTIMORE, March 12—The Maryland Pressed Steel Co. of Baltimore and Hagerstown, Md., has taken over the manufacture and sale of National and Pasco wire wheels, the product of the National Wire Wheel Works, Inc. Through an exclusive license agreement covering a long term, the manufacture and sale of these wheels and their component parts is centered in the one company. The Maryland Pressed Steel Co. has been manufacturing National and Pasco wire wheels during the last year, and the National Wire Wheel Works, Inc., has conducted the selling.

PEN BROECK REORGANIZES

LOUISVILLE, KY., March 12—The Pen Broeck Tyre Co. has undergone a reorganization and is putting on the market an improved Pen Broeck "Thoroughbred" tire and also a line of tubes.

Schweinert Elected to Head A. Schrader's Son

NEW YORK, March 12—M. Charles Schweinert has been elected president of A. Schrader's Son, Inc., by directors at a special meeting this week, to succeed Dr. Charles K. Cole, who died recently at Pasadena, Cal. Schweinert has been employed with the company for thirty-four years, latterly holding important official positions.

The new president of the company has been responsible for the development of many new designs in tire valves, in which the company specializes, his latest valve being a high pressure valve for service on heavy pneumatic tires designed for truck service.

Air Veteran Named Curtiss Saleshead

NEW YORK, March 12—Maurice Connolly of Dubuque has been appointed general salesmanager of the Curtiss Airplane & Motor Corp., succeeding J. C. Davies, who resigned recently to enter the airplane distributing field. Connolly held a major's commission in the air service and before the outbreak of the war served one term in Congress as representative from the Third Iowa district. He and F. H. LaGuardia, now president of the New York Board of Aldermen, bear the distinction of being the only two men in the United States with the dual honor of having served in Congress and received their flying wings.

TITUS ON RENAULT STAFF

NEW YORK, March 12—As an indication that plans for a large scale business in Renault products in this country are rapidly maturing, there is much of interest in the appointment by George B. Warner, general manager of the Renault factory branch here, of Fred J. Titus as sales manager. Titus is a veteran in the automotive business in this country and has long been identified in a prominent way with the marketing of high grade automobiles.

The post-war line of Renault products includes several models each of passenger cars, motor trucks, tractors, aeroplanes and aviation motors, marine motors, stationary engine sets, electrical automotive equipment, etc. It thus affords a wide scope for the ripe experience and rare ability which Titus brings to his new connection.

JEFFERS JOINS FIRESTONE

TORONTO, March 13—R. H. Jeffers has been appointed general manager of the Firestone Tire & Rubber Co. of Canada, Ltd., at Hamilton. The company has purchased a 135-acre site, which will be known as Bartonville. On one half of the site will be built a large plant with a floor space of about 320,000 sq. ft. The remainder of the site will be used for model houses, community halls and stores for employees of the company.

Men of the Industry Changes in Personnel and Position

F. C. Steward has been appointed advertising manager of Beneke & Kropf Mfg. Co., Chicago, makers of Rayfield carbureters. Steward formerly was advertising manager of the McDagell Co., Frankfort, Ind.

R. C. Sackett, formerly advertising manager for the Studebaker corporation at South Bend, has entered the trade in Cincinnati. He is interested in E. S. Gahagan & Co., Studebaker distributors.

E. F. Benson, formerly of Detroit, has been appointed manager of the Fisk Rubber Company branch at 1725 Broadway, New York. Until January of this year Benson was associated with the Ajax Rubber Co. as district manager at Detroit. Since then he has been connected with the Fisk company.

G. H. Dahrymple, for the past three years purchasing agent of the Spacke Machine & Tool Co., Indianapolis, makers of lightweight cars, automobile axles and automotive equipment, has resigned his position, effective May 1.

O. L. Formingle, research engineer of the Fifth Avenue Coach Co., has joined the Wichita Falls Truck Co., Wichita Falls, Tex., as chief engineer.

Will H. Ritter, sales representative with the English & Mersick Co., New Haven, has been appointed second vice-president and salesmanager.

R. A. Kiken has been appointed service manager of the engine division of the Buda company.

Edward F. Babcox, sales manager of the Rubber Products Co. of Barberton, Ohio, has resigned to accept the vice-presidency and a directorship in the Akron Advertising Agency Co. of Akron.

THREE YEAR TRADE TRIP

KOKOMO, IND., March 13—Leonide Barrere, an exporter and engineer, has been engaged by the Haynes Automobile Co., as special travelling export representative. After a month's stay at the Haynes factory, Barrere will leave on a three years' trip to the important cities in Europe, Asia, Africa and South America.

Barrere is a graduate electrical and mechanical engineer. His linguistic attainments include a knowledge of seven languages.

LEWIS NAMES PERSONNEL

FOSTORIA, OHIO, March 12—The Lewis Motor Mfg. Co., maker of the Lewis Ultra-Six marine engine, has announced the following personnel: Ralph D. Lewis, president; R. C. Gilbert, vice-president; Edward J. Bouchard, treasurer; Joseph E. Pratt, secretary, and Charles S. Monson, salesmanager.

LaFayette Perfects Distributing Plans

INDIANAPOLIS, March 13—E. C. Howard, vice-president of LaFayette Motors in charge of the distributing organization, announced several connections with prominent distributors who will handle D. McCall White's new eight-cylinder car. C. P. Rockwell, head of C. P. Rockwell Inc., 640 Commonwealth Avenue, Boston, one of the best known dealers in New England, has secured the Boston territory.

Greer-Robbins Co., Hupmobile distributors on the Pacific Coast, have been given the distribution for northern California with headquarters in Frisco. The lower half of the state will be handled by the Troy Motor Sales Co., headed by John J. Troy and manager Harry J. Coger, both prominent in automotive circles on the Coast.

Exclusive representation in Pittsburgh has been given the H. H. May Motor Co. Associated with May is J. L. Costella. Hayward-Cameron Co. will handle the LaFayette in Omaha. The Walker Motor Co., composed of John C. and his son J. Curtis Walker, will have charge of distribution in the nation's capital. J. Henry Smith, head of the LaFayette-Smith Motors Co., is Chicago distributor, and Hugh T. Porter holds the New York territory. Business will be operated under the name of the Porter-LaFayette Co.

The Losey-LaFayette Motors Co., headed by R. H. Losey, gets the Indianapolis distribution, and R. A. Nicolls and R. B. Bush, operating under the name of LaFayette Motors, will represent the company in Kansas City territory.

McCOMB JOINS McCORD

DETROIT, March 13—Henry G. McComb has been appointed general manager of the Russel Motor Axle Co. by the McCord Mfg. Co., Inc., which now owns and operates that company in addition to its other old and recently acquired interests. McComb, who was associated with many of the pioneer automobile builders, recently returned from Europe, where he went in the interest of prominent eastern truck builders to investigate European practice in truck design, particularly pertaining to axles.

The recent purchase of the Racine Mfg. Co., body makers of Racine, Wis., in addition to the axle unit, adds two important automobile parts to the already considerable variety of McCord products.

HEADS M.-P. ENGINEERS

INDIANAPOLIS, March 15—James McGlashan, who for two years has been head of the engineering department at the York, Pa., plant of the Martin-Parry Corp., recently was advanced to the position of chief engineer of this corporation, and will make his headquarters at the York factory.

In his new position he assumes charge of the designing and engineering departments at the Martin-Parry plants at York and Indianapolis.

Calendar

SHOWS

- Mar. 20-27—Trenton, N. J. Annual Automobile Show. Armory. Trenton Automobile Dealers' Assn. John L. Brock, Manager.
- Mar. 20-27—Pittsburgh. Motor Square Garden. Automotive Association, Inc. John J. Bell, Manager.
- Mar. 22-27—Duluth, Minn. Automobile Show. Duluth Auto Trades Assn. W. F. Daly, Director.
- Mar. 22-27—Utica, N. Y. Annual Automobile Show. Utica Motor Dealers' Association.
- Mar. 22-27—Oklahoma City, Okla. Annual Automobile Show. Oklahoma City Motor Car Dealers' Assn. G. W. Woods, Manager.

- April 21-28—San Francisco. National Aeronautic Exposition. Exposition Auditorium.
- Oct. 6-16—New York. Electrical Show. Grand Central Palace. George F. Parker, Manager.

FOREIGN SHOWS

- April 3-May 4—Buenos Aires. Exposition of U. S. manufacturers.
- May 15-June 13—Cars, Parts and Accessories. Antwerp.
- June 26-July 25—Commercial vehicles, tractors, camions and engines. Antwerp.
- July 9-20—London, England. International Aircraft Exhibition. Olympia. The Society of British Aircraft Constructors.
- Aug. 7-Sept. 15—Motorcycles, sidecars, etc. Antwerp.

- October—London. Commercial Vehicle Show, Olympia.
- November—London. Passenger Car Show, Olympia.

CONTESTS

- August, 1920—Paris, France. Grand Prix Race. Sporting Commission Automobile Club of France.
- June, 1920—Omaha, Neb. Reliability Truck Tour.

CONVENTIONS

- April 27-29—Atlantic City. Increased Production Convention, Chamber of Commerce of the United States.
- May 9-12—Independent American Petroleum Congress, Congress Hotel, Chicago.
- May 12-15, 1920—San Francisco. Seventh National Foreign Trade Convention.

S. A. E. MEETINGS

- Mar. 23—Buffalo Section Meeting. Subject—Combustion of Fuels in Internal Combustion Engines. J. H. Hunt, Dayton Engineering Laboratories.
- Mar. 25—Pennsylvania Section Meeting. Subject—High Speed at Great Altitudes. Com. H. C. Richardson, U. S. N.
- Mar. 26—Mid-West Section Meeting, Auditorium of the Western Society of Engineers.
- April 7—Minneapolis Section Meeting. Subject—Tractor Weight and Drawbar Pulls.
- April 8—Metropolitan Section. Automobile Club of America, New York. Subject—A Study of Tire Deflection and Unsprung Weight in Trucks. Speaker, A. F. Masury. Illustrated.

Bus Lines to Start in Detroit May 15

DETROIT, March 12—Motorbus transportation will start in Detroit May 15. The first line will be on Woodward Avenue, and a complete unit of 20 buses, with repair shop and other equipment, will arrive in Detroit the first week in May from New York, where they are being constructed.

The company plans two and one-half minute service, with a seat for every passenger. Seating capacity of the double-deck cars to be installed will be 48 persons, and when all seats are filled no stops will be made until vacancies begin to occur. Fares will be 10 cents.

As evidence of the popularity of the motorbus in Detroit, many factory ex-

ecutives have appealed to the promoters to open lines to their plants, and this will be done wherever possible, just as rapidly as equipment can be secured. Routes will be extended to those parts of the city only where there is no street car service, or where it is inadequate.

Co-operation of the Board of Commerce, the Retail Merchants' Bureau and other civic organizations assures success for the enterprise. The personnel of the company includes some of the most prominent business men in Detroit.

TO OPEN IN CANADA

WALKERVILLE, ONT., March 12—Kales Stamping Co., Detroit, is preparing to open up a Canadian factory, it is understood, for the manufacture of automobile mirrors.

Illinois Holds Road Work to Minimum

CHICAGO, March 13—Pulling Illinois out of the mud is a task which seems fraught with unusual difficulties, and its accomplishment is once more delayed. At a conference between officials this week in Springfield, and with the approval of Gov. Frank O. Lowden, it was decided to confine Illinois' road building activities for 1920 to two projects, totaling thirty-nine miles of roadway.

Mounting costs of road construction are the cause of the latest Illinois delay. When the famous Illinois State bond issue of \$60,000,000 was first proposed five or six years ago, road costs were estimated as considerably under \$20,000 per mile. When the bond issue was voted in 1918, road enthusiasts regretted they had not asked for \$120,000,000 rather than \$60,000,000. Now it is estimated that it would cost about \$200,000,000 to carry through the program originally outlined.

Bids were asked for numerous projects this spring, and the lowest bid submitted called for \$42,000 per mile of construction, while the average cost per mile for all work which was proposed was approximately \$44,000. These high costs decided State road officials to call off the road program until costs were lower, and the only work which will be done this year will be along the Dixie Highway and National Old Trails road, for both of which there is considerable Federal Aid money available.

CLAROTTA TO MAKE CARS

MILWAUKEE, March 15—The Clarotta Mfg. Co. of Milwaukee is the name of a new \$1,000,000 corporation organized under the laws of Wisconsin by Walter A. Kuebler, Otto G. Pfeifer and Thomas C. Hanson, 682 Fifty-first Street, to engage in the manufacture of motors, motor vehicles, automotive equipment, machinery, etc. The project has not matured sufficiently to make possible a detailed explanation of its purposes at this time.

A. A. A. Sanctions Twenty-Seven

Races and Two Tours for 1920

NEW YORK, March 12.—Speedway and dirt track events for the spring, summer and fall of 1920, sanctioned by the A. A. A., have just been announced. Important among the events scheduled are the Los Angeles, Indianapolis, Uniontown, Tacoma and Cincinnati races; the Truck Reliability Tour, conducted by the Omaha Bee, and the Glidden Tour, New York to San Francisco.

A list of all sanctioned events with the dates thereof follows:

March	21.....	Speedway—Los Angeles, Cal.....	Los Angeles Speedway Assn.
May	1.....	Dirt Track—Hanford, Cal.....	Hanford Board of Trade
May	31.....	Speedway—Indianapolis, Ind.....	Ind. Motor Speedway Co.
May	31.....	Dirt Track—Brockport, N. Y.....	Frank G. Bell
June	1.....	Truck Reliability Run—Omaha, Neb.....	Bee Publishing Co.
June	12.....	Speedway—Uniontown, Pa.....	Uniontown Speedway Assn.
June	17.....	Dirt Track—Portland, Ore.....	Robert A. Hiller
June	19.....	Dirt Track—Ogdensburg, N. Y.....	Frank G. Bell
July	4.....	Speedway—Tacoma, Wash.....	Tacoma Speedway Assn.
July	4.....	Dirt Track—Hanford, Cal.....	Hanford Board of Trade
July	4.....	Dirt Track—Spokane, Wash.....	Robert A. Hiller
July	5.....	Dirt Track—Batavia, N. Y.....	Frank G. Bell
July	17.....	Dirt Track—Warren, Pa.....	Frank G. Bell
July	24.....	Dirt Track—Watertown, N. Y.....	Frank G. Bell
July	31.....	Dirt Track—Fulton, N. Y.....	Frank G. Bell
Aug.	7.....	Dirt Track—Erie, Pa.....	Frank G. Bell
Aug.	14.....	Dirt Track—Buffalo, N. Y.....	Frank G. Bell
Aug.	21.....	Dirt Track—Johnstown City, Pa.....	Frank G. Bell
Aug.	28.....	Dirt Track—Canandaigua, N. Y.....	Frank G. Bell
Aug.	20-21.....	Dirt Track—Middletown, N. Y.....	Horace P. Murphy
Aug.	27-28.....	Dirt Track—Flemington, N. J.....	Horace P. Murphy
Sept.	1.....	Glidden Tour—N. Y. to San Francisco.....	Contest Board A. A. A.
Sept.	6.....	Dirt Track—Hornell, N. Y.....	Frank G. Bell
Sept.	6.....	Speedway—Cincinnati, Ohio.....	Cincinnati Speedway Co.
Sept.	6.....	Speedway—Uniontown, Pa.....	Uniontown Speedway Assn.
Sept.	17-18.....	Dirt Track—Syracuse, N. Y.....	Horace P. Murphy
Sept.	25.....	Dirt Track—Allentown, Pa.....	Horace P. Murphy
Oct.	1-2.....	Dirt Track—Trenton, N. J.....	Horace P. Murphy
Oct.	8-9.....	Dirt Track—Danbury, Conn.....	Horace P. Murphy

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Air Mail Shows Commercial Possibilities of Planes

This article was written by Mr. Praeger, who heads the aerial division of the Postal Department, after reading the article in last week's issue of this publication entitled, "Shall We Put the Airplane to Work in America?" It is an answer to the critics who doubt the peace-time abilities of heavier-than-air craft.

By Otto Praeger*

THE next years in our history will be years of peace. The question that confronts aviation is, what will be the trend of flying developments in a protracted peace period? Is it conceivable that this development will be purely military in character or even that military flying will predominate? Our highest military authorities have pointed out that it would be financially impracticable for a nation over a long period of peace to keep up a military flying establishment of sufficient magnitude to put the nation on equal footing with the enemy in time of war. These authorities, on the other hand, point out that the hope for air supremacy in the event of war depends upon the peace-time commercial development of the art of flying.

Flying is transportation, and the history of all transportation—notably railway and automobile transportation—has been that it has been developed in times of peace to meet commercial necessities and commercial expansion, and in times of war it was commandeered to meet the necessities of war. I know there is a small group of men who have never been interested in aviation except as an instrument of war and who will not concede any real commercial outlook

for the airplane and, on the other hand, that there is a vast group of men who, while not believing in the commercial possibilities of aviation, still have an open mind because their conclusions are really only surmises reached in the absence of information.

The operations of the air mail for a period of almost two years have demonstrated that the airplane is capable of highest commercial development. It has demonstrated that it is possible to maintain a daily operating schedule with the airplane; that the airplane has that degree of dependability of operation in the air which is essential to commercial utility, and that, for some limited classes of commercial operation, involving great speed, the airplane can operate dollar for dollar as cheaply and at an expedition some one hundred per cent greater than any other medium of transportation.

I am referring now to the cost of carrying certain character of mail by airplane and in railway distributing cars. I will admit it is the only instance which has come to my notice where the airplane operates as cheaply and in some instances much more cheaply than the railway service. Perhaps it is not a fair instance, for there are no railway transportation charges in the world as shamelessly and outrageously high as those which the Interstate Com-

*Mr. Praeger is Second Assistant Postmaster General, in charge of the aerial mail.

merce Commission has decreed that the American taxpayer shall pay for carrying the mails. However, eliminating this single type of competition where the airplane is dollar for dollar cheaper than in certain cases of transportation in railway distributing cars, you still have the element of greater speed which creates for the airplane a legitimate field in our commercial activities.

In this article I shall endeavor to show how the postal operations have established the reliability and dependability of the airplanes in scheduled transportation; how it has rendered a distinct service to commerce through the expedition of substantial quantities of mail, and lastly, how it is possible to perform certain transportation more cheaply than by railroad.

The air mail service has been in continuous operation since May 15, 1918, and its performance record has been a shade better than 90 per cent. The air mail has operated at all seasons of the year and through the worst winter for blizzards and snow that the country has seen in some time. It has operated 200 miles along the Atlantic seacoast with all the fog and weather conditions usually found in that section extending from Long Island Sound to the Potomac River. It has operated across the Allegheny Mountains from New York to Cleveland over a territory heavily wooded with first and second growth timber, and in the snow and irregular wind and storm conditions usually found over mountain terrain.

It has operated over a stretch of more than 320 miles in the wind and snow conditions characteristic of the winters along the edges of the Great Lakes. In this character of territory during the past winter it has made some remarkable records. During February, operating part of the time with snow skids instead of wheels, the air mail planes performed 36 successful trips out of a possible 46 between New York and Washington. The operations in the Great Lakes region were no less gratifying. During the month of January the air mail made 20 out of 26 trips from Cleveland to Chicago, and 21 out of 26 trips from Chicago to Cleveland. During the month of February it made 41 successful trips between Chicago and Cleveland, out of a possible 48.

As an indication not only of the dependability of the airplane to-day but also as a tribute to the Liberty engine and testifying to the efficiency of the Post Office Department aviation personnel in the upkeep of planes and engines and in the intelligent operation of the aerial equipment, I will cite a few individual records of air mail pilots:

Of the five aviators who have been flying the mail for the eight months beginning July 1, 1918, through summer and winter, Pilot Max Miller started 54 trips, of which he completed 51 without forced landings from any cause whatsoever, whether mechanical or weather. His percentage of perfect trips was 95.37.

Of the four pilots who flew seven months, including this winter's flying, Aviator H. T. Lewis started 46 trips, of which he made 45 without a forced landing, for any cause, and completed the entire 46 trips on which he started.

Of four pilots who have been flying for the past six months, Aviator M. K. Reddick flew 53 out of

62 trips without any kind of forced landings and has to his record only three uncompleted trips.

Of the three fliers who have flown only through the five months of the past winter, Aviator Paul W. Smith made 14 out of 17 flights without a forced landing and a record of only two uncompleted trips.

It should be borne in mind that these trips are non-stop flights of 200 miles each on the lines east of Cleveland and 325 miles between Cleveland and Chicago.

Some interesting light has been thrown upon the question of the serviceability of aeronautical motors by the records of the air mail service. Formerly it was considered that a stationary type motor would give about 50 hr. of service before overhauling, and that the total life of a motor was about 250 to 300 hr.

The records of the air mail service show that the Liberty high compression engines have averaged 45 hr. before overhaul and that the low compression type has given an average of 90 hr. Excluding from consideration the engines overhauled because of accidents to the planes in which they were installed, it was found that a Liberty motor, high or low compression, can be depended upon for 90 hr. of service, which in miles is about 9,000 and, then, with the regrinding of valves and inspection of bearings, can continue 50 more hours before a general overhaul is required.

Over half a dozen motors have a running time of over 150 hr. One has a record of 157 hr. 10 min. These motors are awaiting overhaul, at which time the condition of the various parts, as the result of this long run which really sets a new record for running time, can be ascertained. No engines have yet worn out in service. Some Liberties have been overhauled as many as three times. However, a Model A Hispano-Suiza, which was in the first mail ship, has the record to date for longevity. After completing over 250 hr., with a number of overhauls, it was installed again in the original ship and ran 125 hr. straight before being pulled out again on the assumption that something ought to be wrong with it. The bearings were slightly worn.

So much for flying results. Now, let us consider what is the value of this service. First, know that the air mail service is not a special service for a class of letters on which extra postage is paid. Air mail letters go at the same rate of postage as is paid on train letters—2 cents an ounce. The air mail simply supplements the great railway mail transportation system. Its schedules are so woven in with the train schedules as to expedite letter mail by from 12 to 16 hours to the public.

Take the route from New York to Washington. Its purpose is to expedite the New England night mail. This mail is taken from the trains arriving in New York from New England early in the morning and is carried by the plane leaving at 8:40 a. m., the mail arriving in the Washington Post Office before noon. This mail goes out on the 12:20 o'clock carrier delivery. If the plane is delayed by bad headwinds, the mail catches all city carrier deliveries leaving the post office at 1:30 p. m. This mail formerly arrived by train in Washington at 1:45 p. m., if the train was on time, and made a close connection with only a part of the carrier deliveries, but the records showed that even these carrier deliveries were missed last year by the railroad 26 per cent of the time, resulting in delivery of all this mail the following day. The fact that the complaints of the New England business men dropped off by more than 50 per cent immediately upon the establishment of this schedule last July should be convincing evidence as to whether the service is useful.

The air mail from Washington is composed of letters from the Southern States arriving in Washington before 10 a. m. This mail arrives in New York City by airplane in time for the carrier delivery in the afternoon instead of the next morning. In effect, it is an advance of the mail practically one business day.

Between New York and Chicago, we carry westward New York City letters in time for delivery that morning in Cleveland and the rest of the mail, being New York City letters for the Middle West, is put on a train at Cleveland that makes connections at Chicago 12 to 16 hr. earlier than if it had started from New York by train. At Cleveland we take from New York Central train No. 19, which left New York at 5:30 p. m. of the previous day, letter mail for Chicago city. Had the mail remained on the train, instead of being taken by airplane, the letters would have reached Chicago late in the afternoon after carrier deliveries had ceased and could not be delivered until the next morning, whereas the airplane puts these letters in Chicago around 1 p. m. and in ample time to catch city carrier deliveries the same afternoon.

Eastbound, the mail from Chicago and the Middle West and from Cleveland and connections is brought to New York City in time for delivery that day instead of the next morning.

Here is the result:

You can mail your letter in New York City this afternoon in time to catch the New York Central train at 5:30 p. m. The air mail picks up that letter from the train on its arrival at Cleveland to-morrow morning and puts it in Chicago in time for delivery to your correspondent to-morrow afternoon, less than 24 hr. from the time of mailing. Your correspondent can reply at his leisure to-morrow afternoon or to-morrow night and mail it in time to leave Chicago at 11:15 p. m., on train No. 28. The air mail picks up that letter at Cleveland the next morning and delivers it in New York in time for you to read the answer the same afternoon, or in less than 48 hr. after you wrote and mailed your letter.

Is that service worth while? Does the getting of his mail this afternoon instead of to-morrow morning mean anything to a business man?

Now, what is this air mail service costing the public? It is not costing the public one cent, but it is saving the people more than \$100,000 a year. It costs considerably less than \$400,000 a year to operate a 1500-lb. mail capacity airplane one round trip daily between New York and Chicago and, by the establishment of such a schedule, the Post Office Department has been able to discontinue nearly \$500,000 worth of railroad distributing space and clerical hire.

I know it is a mystery to many how it is possible for an airplane to displace such a quantity of transportation space. It will occur to you at once that no airplane ever built can carry the volume of mail that it is possible to load into a 60 ft. car. But these cars are traveling post offices filled with racks and cases over which mail is distributed en route and indeed a small airplane can carry all of the particular mail which had made it necessary to put on such a car, to meet the needs of commerce. A mail plane with but a 400 lb. mail capacity has displaced a 60 ft. car between Cleveland and Chicago and the same size plane has displaced a 60 ft. working car between New York and Washington. If you abolish the air mail to-night, I would have to re-establish to-morrow morning the New York-Washington car and distribution and the New England letter mailed Tuesday night would be delivered by carriers in Washington on Thursday morning

if carried by train instead of Wednesday afternoon if carried by airplane.

This service between New York and Washington by railroad costs at the rate of \$162,000 per year, whereas the faster service by airplane costs only \$120,000 per year. I am sure this situation is not fully understood by Congress. I don't believe that Congress would deliberately not provide the appropriation for the New York-Washington route and thereby force the mail on the slower delivery by train and at an expense of \$42,000 a year more than by airplane. This would be the effect of the appropriation recommended by the Senate Committee on Post Offices and Post Roads, just barely sufficient to operate the route from New York to San Francisco and leave nothing for the service between New York and Washington.

While the Post Office Department is anxious that Congress should appropriate enough money to enable it to continue the service between New York and Washington, it is gratified that the committee has recommended an appropriation of \$1,415,000 for an air mail line from New York to San Francisco. If Congress will authorize an appropriation for such a route, this is how it would affect your mail for the Pacific Coast:

A letter mailed by a New York business man in the regular course of his day's work, late in the afternoon, or any time up to 1 a. m. Monday, will arrive in San Francisco by 9 o'clock Wednesday morning instead of Thursday afternoon by train. But that does not mean that you would receive your train letter Thursday afternoon, because the train is nearly always late in San Francisco and, in a majority of cases, your letter would get to your correspondent Friday morning, two days later than by air mail. But the case is much worse than that. In order to make this 90½ hr. train schedule from New York to San Francisco, the train must make a close connection of 1½ hr. at Chicago—and in that hour and a half the mail must be unloaded at the La Salle depot and transferred across the city to the Union Station where connection is made with the Burlington train. I am assured by our mail transportation superintendents that on an average during the year this connection is missed 40 per cent of the time. Whenever this connection is missed, the mail into San Francisco is delayed a full 24 hr. During the month of January, that connection was missed 31 days out of 31—or 100 per cent of the time. The air mail can reach San Francisco 12 hr. late and still beat the train by 20 hr.—if the train is on time. We can have a smash-up and lose 24 hr. and still beat the train into San Francisco by a half a business day and, if the letter that you mail at the close of your business hours fails to get off on the 8:40 p. m. train out of New York or if the train fails to make the close connection at Chicago, the air mail could be 48 hr. behind its schedule and still beat your letter into San Francisco.

I know that the wonderful performance of the air mail in its 21 months of operation is unknown to many persons. I know that some people are constitutionally opposed to every forward step in human endeavor. I know that some postal clerks are needlessly fearful of the effect of the air mail on their jobs. Where do the business men of the country line up? With the old woman who tried to sweep back the ocean with her broom? With the postal employees' walking delegate who goes about with a bomb under his coat-tail for the air mail? I am confident that when the facts about the air mail become known, the men who make the wheels of American progress go round will vision the possibilities of the airplane and lend a hand to speed the day of this new and inevitable era in transportation.

Puzzling Production Difficulties Confront the Italian Factories

The manufacture of automotive equipment in that country has been severely handicapped, the shipping and delivery problems being the most troublesome. Mr. Bradley reveals herewith the production plans of the larger makers, after having made an extensive trip to the various factories.

By W. F. Bradley*

TURIN, ITALY, March 3.

INDIFFERENT shipping facilities are seriously handicapping the Italian automobile industry. Although fifteen months after the armistice, military freight still has priority on all Italian railroads and, although the value of the lira is low and export business is desirable, manufacturers cannot get needed freight cars to take their products to the ports.

The Fiat company states that their storage space is filled with automobiles that cannot be sent out of the country for lack of freight cars. Each day the accumulation grows more acute, as shippers are refusing to accept any more until their yards have been cleared.

The average time required for shipping an automobile from Turin to London, a distance of not much more than 1000 miles, is 43 days, but it frequently takes three months. In the past, all Italian automobiles for the English market went overland through France to one of the Channel ports. This week, for the first time, English representatives of the Fiat company chartered a steamer to take automobiles direct from Genoa to London. It was nearly five times more costly than by railroad, but under the circumstances there was no choice.

It is expected that during the summer the Fiat company will send their automobiles by road across France, thus delivering them from Turin to London under their own power, with the exception, of course, of the short trip by steamer across the Channel. This plan has had to be considered owing to the shortage of freight cars in Italy and the disorganized condition of the French railroads. During the war most of the Italian automobiles for the French and American armies were sent into France by road, but cost then was of small consideration. The drive-away entails the crossing of the Alps at an altitude of 10,000 ft. above sea level, the pass being generally free from snow seven months in the year.

Fiat is only 60 per cent up to war production. The output is 50 touring cars and trucks and 5 agricultural tractors per day, although during the war, the factory daily produced 100 automobiles of various types. The first of the entirely new post-war types are coming through the factory, but the bulk of the production still is trucks or intermediate types of cars. These intermediate types are rapidly disappearing and within two months it is expected the three new models will be in regular production.

Fiat has been held back by labor troubles, shortage of raw material and coal and the work involved in transform-

ing the shops from war to peace production. The body shops, in which the greatest changes had to be made, are not in such a forward condition as other parts of the factories.

It is Fiat's intention to give great attention to export tractor business. During the past year, Fiat has had wonderful success in all the tractor trials in which their machine took part. In the English trials, the company won one first, two second and one third prizes, these results being better than were obtained by any other machine. In public competitions in France and Belgium, equally good records were made. However, the factory is unable to meet requirements, but plans are being made to devote a large part of the factory exclusively to tractor work.

This company is arranging to overcome the coal problem by using electricity and crude oil. Eventually no coal whatsoever will be burned in the Fiat plants. The machine shops and steel works will be entirely electric. The current is being obtained from water power in the Alps and has to be transmitted less than 40 miles. At present there is a shortage of current, and factories in the Turin center alternately work on Sundays and shut down on the following day.

Lancia is in full production. He is building a four-cylinder, 30-hp. type similar to the pre-war car and expects to get into production on the new 12-cylinder car exhibited at the recent shows by the middle of the summer. This car has finished its tests in a satisfactory manner, but production cannot be started immediately.

Ansaldo, the largest engineering concern in Italy, has entered the automobile field and has just gotten out a light, five-passenger car. It has a four-cylinder engine of 2.7 x 5.1 in., having valves in the head and overhead camshaft. The car has center control, three speeds and reverse, instead of the four invariably employed by other Italian makers, and electric lighting and starting. Hotchkiss drive is used, with two universal joints, this being the only car built in Italy on this system. With this exception, the two axles, the springs, and the steering appear to have been copied from the new Fiats. Weight has been kept low, the complete car with five-passenger body, spare steel wheel and all accessories being said to weigh not more than 1700 lb. Although Ansaldo is a huge engineering concern, being equal to, if not larger than Fiat, it is stated that the car output this year will not exceed 1500.

There is a real automobile famine in Italy, it having been created by the restriction of imports and the slow production. Locally the shortage will become greater if a

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decree, already drawn up, receives the royal signature. It forbids the sale of new cars in Italy, and thus will force the whole of the Italian automobile production into foreign markets.

This drastic proposal, the date of which is not certain, appears to have been proposed with a view to improving the Italian rate of exchange and also to prevent the mad speculation on automobiles now prevalent in Italy. It is believed that 90 per cent of the new automobiles sold by dealers, or manufacturers, in Italy to private owners are immediately bought up by speculators at an increase of 25, 30 or even 60 per cent on the original price. These speculators either put the car in storage against a further rise or send it abroad at a substantial profit.

Most of the manufacturers are doing their best to stop this practice. Lancia, for instance, severs all connection with any of his dealers who sells a car above the list price. Manufacturers, however, are helpless against the private owner who agrees to sell his new car a few hours after it has been delivered at, say \$2,000 more than he paid for it. Among the persons agreeing to these resales are the elite of Italian society, who, although in need of a car, cannot resist the temptation to make money so easily. The speculators have such a profitable field that they buy up new and used Fiats and Lancias and send them to England, where they can dispose of them at good prices over the heads of the accredited distributors in that country. As an instance of the high prices prevailing, Fiat touring cars which were sold to the American Army during the war for \$2,400 are returned to Italy and can find buyers at \$4,000 (these are nominal rates of exchange). The

cars have seen war service and are only patched up to look new.

If the proposed decree goes into effect it will force speculators to throw their cars on the market, and it will prevent them shipping abroad at extortionate prices. The measure is so unusual that there is a fear it would provoke retaliation by foreign makers.

A recent incident at the Ansaldo factory tends to give the impression that Italian labor conditions are very unsettled. At these works a number of men established a soviet, declared the management incompetent and voted themselves in charge of the works. A few hours later they were turned out by troops and the management resumed control. This is only a local outbreak by a few hotheads, and need not be accorded much importance.

In the Turin center, which comprises the whole of the automobile industry, labor is much more organized and the movement is of a more political nature. The workers are claiming a voice in the directorate of the big companies. Because the management asked for a meeting between themselves and the workers to be postponed for two hours, all the men in the Fiat shops downed tools for half a day last week.

Generally the Italian workers are not dissatisfied with their material conditions, for since the war they have secured the eight-hour day and important increases in wages. Lancia says that the best remedy for discontent is production. "With the works organized to give regular employment and with a system of premiums for production, there is no talk among the Italian workers about strikes and grievances," he has said.

Revived Cult of Air-Cooled Engines in Britain

IT would be interesting to learn the basis of the revived cult of the unjacketed air-cooled cylinder. Probably it is the outcome of three factors—war-time experience with radial cylinder engines, both of the static and revolving types, the quest for higher thermal efficiency and the search for reduced weight.

This revived cult of the air-cooled cylinder points to a return to the earliest experience with light combustion engines, for it is a fact that the first specimens beyond the experimental stage were unjacketed, and it is also noteworthy that, when indirect cooling was first applied, it was limited to the regions of the cylinder head and valve chambers. De Dion and Aster, in France, and Lanchester and Holden, in England, went through a full range of experiments with air-cooling, followed by water-cooling, and early users of the products of some of these pioneers recall that they failed rather because of lack of the materials now available than for lack of the specific knowledge based on experience which is now found in so many text books and papers.

The problem of materials which combine higher conductivity with freedom from distortion and which are capable of withstanding prolonged spells of a high working temperature, is still formidable, but it may be that its solution will be found rather in improved foundry methods than in some new grade of material. On this score it may be well to note that the "whirling" method—American by the way—of casting, now being used with some success for casting piston rings almost ready for use, may prove to be applicable for fin-jacketed cylinders of plain concentric form, with removable head.

The desirability of reducing the gross weight of the

chassis is beyond dispute, but it is a mistake to suppose that any notable saving of weight results from substituting fins for the water jacket. The saving often amounting to 100 lb. and more is due to the elimination of the radiator and water.

These comments are prompted by the threatened failure—as seems likely by the latest reports to hand—of the *Times* (London) special aircraft pioneer flight from Cairo to the Cape. The lurking cause is the leaking cylinder jackets of the twelve-cylinder Rolls-Royce engines and it will be recalled that, on another long distance flight, a British machine had a breakdown from the same cause. These engines, like the American Liberty, have oxy-acetylene welded sheet-metal jackets and the writer has seen them in course of making and testing. In war time, much of this fine work was done by women, who seemed to be apt at the job and to have the dexterity and lightness of touch peculiar to such work. Possibly this work is being done now by men who on the whole are not as expert with the blow-pipe as the women. Whatever the explanation, the fact is clear that these fine engines are more liable to failure from what may be considered trivial causes than from direct mechanical breakdowns. A sister machine to the Rolls-Royce mentioned before—the "Silver Queen"—is reported also to have crashed from the same defect.

ANNOUNCEMENT is made from Ottawa that Canada is expecting a material increase in immigration this year. Plans are now being laid in the department in charge of such work to take care of an anticipated influx of not less than 60,000 Americans.

Saxon Offers Changed Design and Construction in New Model

Incorporated into this 1920 product, the work of A. P. Brush, are numerous features of interest. It has overhead valves, deep frame construction and double transverse cantilever springs. In addition, the oiling and intake manifold systems and propulsion members are worthy of study.

By J. Edward Schipper

SHIPMENTS on the new Saxon—models of which were exhibited at the recent shows—commenced in the early part of March. It is a new model throughout and present plans call for a minimum production of 7500 cars for 1920.

This Saxon is an entirely different product from any of its predecessors and is a Brush design, incorporating the overhead valve system, deep frame construction and double transverse, cantilever rear springs for which A. P. Brush has stood sponsor. It includes, besides, a number of new features, relating particularly to the oiling system, the intake manifold-ing system, and the propulsion members.

The engine is a four-cylinder block cast, two-bearing type, with $3\frac{3}{8} \times 5$ in. cylinders, giving a piston displacement of 178.8 cu. in. The overhead valves are assembled with the detachable head unit and are actuated through push rods and rocker arms. The engine is mounted at three points, one point at the front and two points on the center cross-member of the frame. The transmission gearset is of the unit powerplant type, being bolted to extension members on the rear end of the crankcase. This is a skeleton construction, lighter in weight than a bell housing, and, although it gives a unit power plant, is not of the completely inclosed construction necessary with clutches requiring an oil-tight housing.

The upper part of the crankcase is cast integral with the cylinder block. The oil pan is a steel stamping. The pistons are cast iron, 4 in. in length, equipped with three $\frac{3}{16}$ in. piston rings, step cut and concentric, all above the piston pin. The pin is clamped in the upper end of the connecting rod and takes its bearing in the piston boss. It is 1 in. in diameter and operates within bronze bushings in the piston. The connecting rods are drop-forged and machined all over. They are strongly webbed at the bearing end to insure a rigid bearing surface. The connecting rod bearings are bronze-backed, babbitt-lined, $2\frac{1}{4}$ in. in diameter and $1\frac{1}{2}$ in. in length.

The crankshaft is particularly interesting, being a two-bearing type and of such diameter that it should be immune from whipping or distortion at any speed within the engine's range. It is fully counterweighted for rotative balance, the two bearings being bronze-backed, babbitt-lined. The front bearing has a diameter of $2\frac{1}{2}$ in. and is $2\frac{3}{8}$ in. long, the rear having a diameter of $2\frac{3}{8}$ in. and is $3\frac{1}{8}$ in. long. These are shimless bearings, carefully aligned, so that there is no break in the bearing metal between the bearing and the cap. The reason for the shimless construction will be brought out in the description of

the oiling system, as this is one of the factors in the oiling scheme.

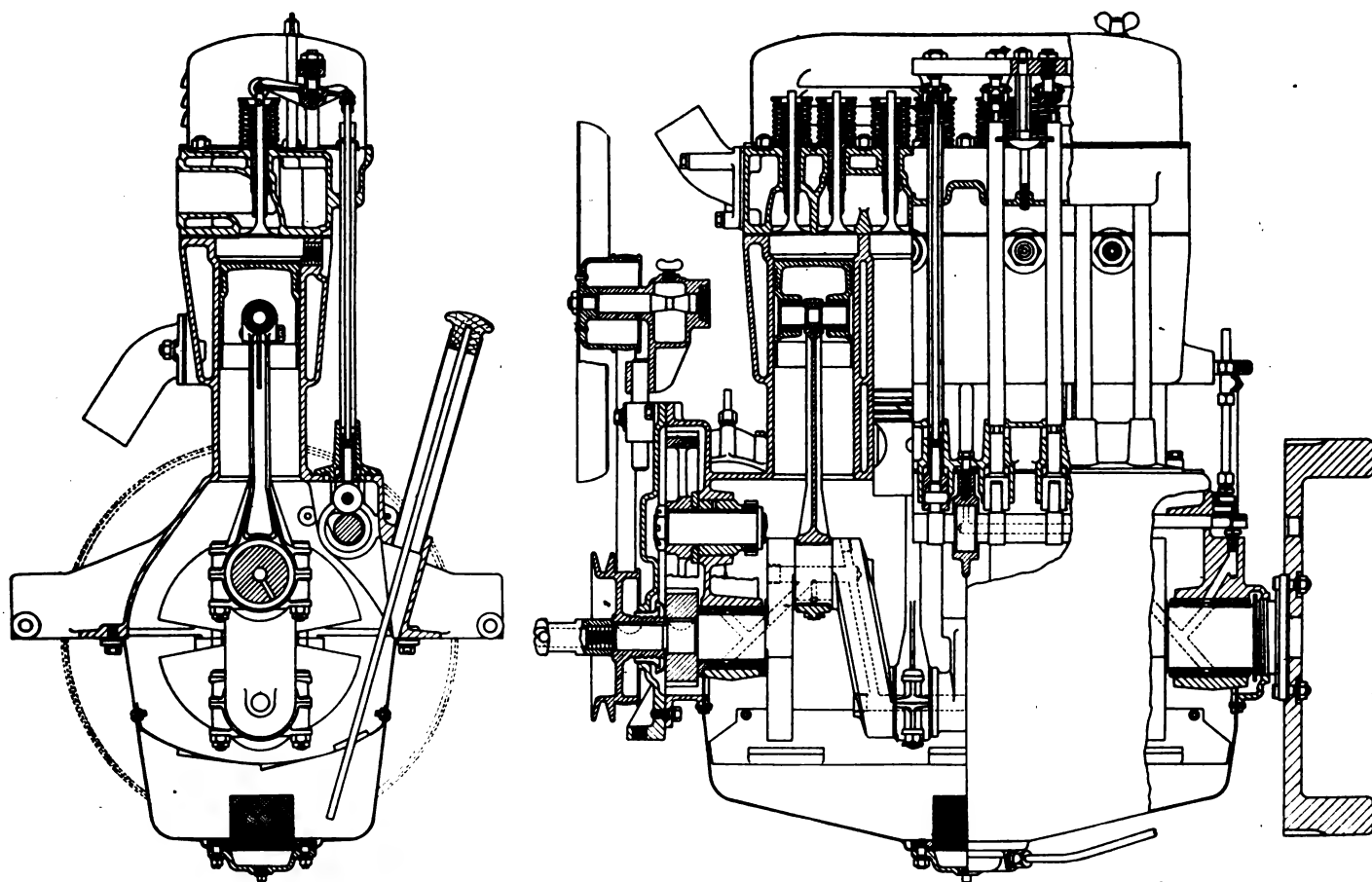
The camshaft is driven by helical gears of $1\frac{1}{4}$ in. face. It is mounted on three bearings and is a drop-forged, integral type, the cams and timing gear being integral with the shaft. The front bearing is $2\frac{1}{8}$ in. in diameter and $1\frac{1}{2}$ in. long, the center $1\frac{3}{4}$ in. by $\frac{7}{8}$ in., and the rear 1 in. by 2 in. The valve

rods are actuated through roller followers and pass through removable guides. The rocker arms, which have contact with the lifter rods and the valve stems, have a rocking contact with each and the adjustment is on the pivot, permitting the valves to be adjusted while the engine is running. The valves are of the tulip type with a $1\frac{1}{2}$ in. clear opening, a $\frac{3}{8}$ in. lift and $\frac{5}{16}$ in. stems. They are of tungsten steel and are equipped with double springs of chrome vanadium steel. The use of the double springs is to guard against periodic vibration, which may occur in case synchronism is set up between the engine and valves at the critical speeds of the valve springs. The entire overhead valve system is covered by a nickel plated, removable cover.

The carburetion system is patented and is designed to obtain a high degree of thermal efficiency. The fuel is introduced through a Stromberg $1\frac{1}{4}$ in. carburetor of the vertical plain tube type. At low engine speeds,



The new 1920 Saxon with touring body



Four cylinder Saxon engine in section

fuel is taken from the carburetor into an expansion chamber located in the manifold just above the throttle valve in the carburetor. On the conical sides of this expansion chamber, the apex of which forms a venturi tube for the manifold, unvaporized particles of fuel are gathered out of the main stream of the fuel and permitted to trickle back to an eddy space, the outer walls of which are formed by serrated rings of metal integral with the exhaust manifold and heated by the exhaust gases. At this point, the globules of fuel are vaporized and passed back into the main stream. This system is designed to prevent unvaporized fuel passing into the combustion chamber, and, furthermore, to assure uniform distribution that is not possible with liquid fuel. It is claimed that the dilution of lubricating oil and the formation of carbon deposit from liquid fuel is solely due to the faulty distribution caused by liquid fuel in the intake passages.

In order to secure equality of distribution of fuel to the cylinders, a distribution chamber is used which compels an eddying of the passing fuel in a uniform manner at the openings of the respective horns of the intake manifold. Each of these horns is divided into two passages, by a vertical wall through the center. The vaporized fuel passes from the distribution chamber to each of the passages of each horn and to common outlets for the front and rear pairs of cylinders. As the flow to each cylinder leaves the common stream at the intake port, it is claimed that the distribution of fuel is uniform. This method of distribution from a point just above the carburetion expansion chamber is claimed to eliminate the surging of gases in the intake manifold. The fuel feed to the carburetor is by the vacuum system.

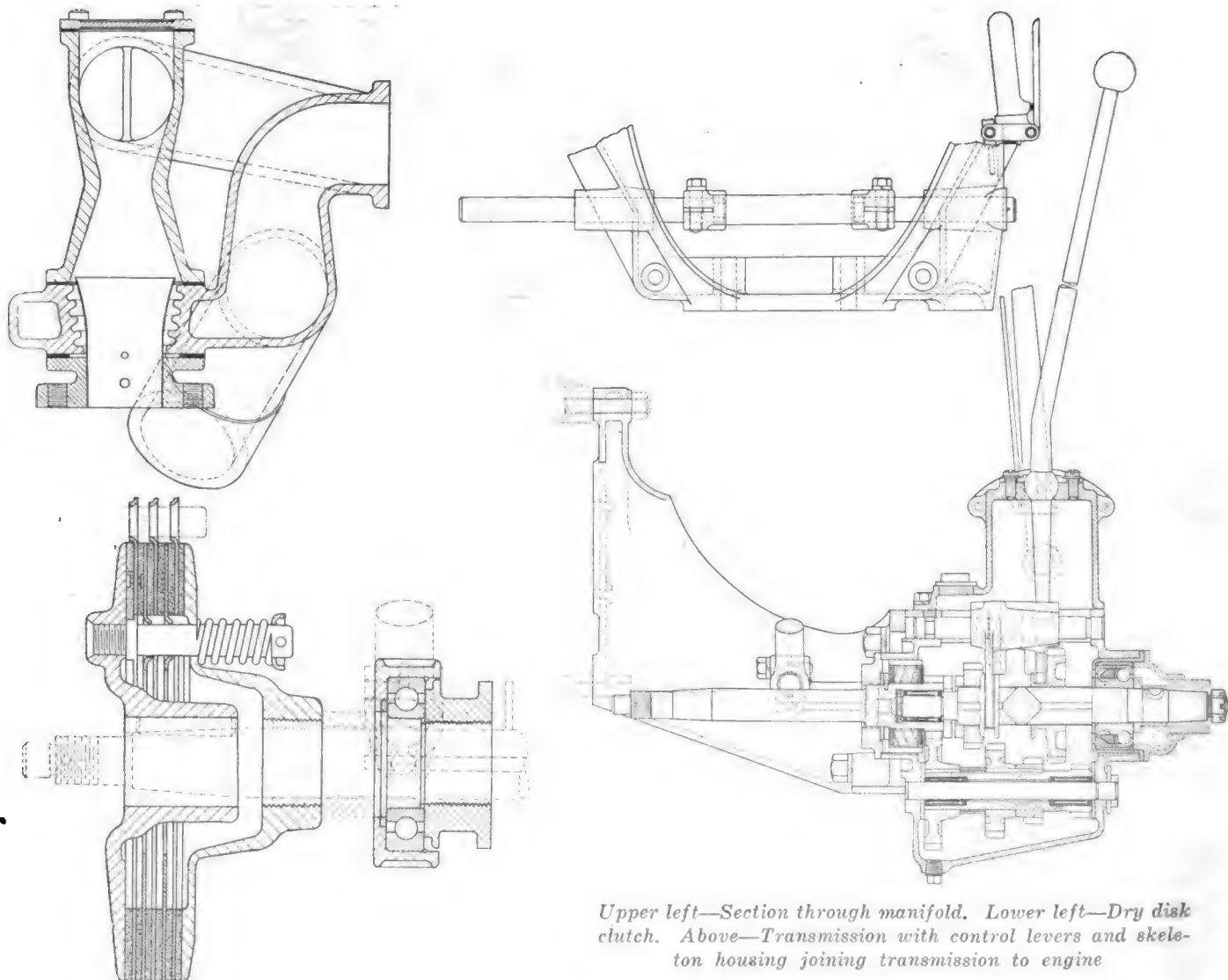
The fuel tank is mounted at the rear and is of 18 gage metal, having a capacity of 15 gal. It is guarded by a frame extension which, with a tire carrier, affords pro-

tection from the rear. The tank is fitted with a gage and filler cap of composition material.

As regards the lubrication system, it should be pointed out that the oil is intended to cool as well as to lubricate the bearings, hence it is circulated at a rate far exceeding that necessary for lubrication only. A gear driven pump at the rear of the camshaft takes oil through a strainer and delivers it through an annular passage in the rear crankshaft bearing at a pressure which varies up to 50 lb. This pressure is controlled by the vacuum in the intake manifold and consequently varies in proportion to the load on the engine. Cylinder wall lubrication is by spray from the connecting rod bearings.

By means of the vacuum control, the flow of oil is at all times governed by the engine speed and the amount used for lubrication is controlled by the pressure. The vacuum system which controls the oil pressure relief at the front end of the crankshaft is in direct communication with the inlet manifold. The crankshaft bearings are not grooved in the customary manner, but there is simply an opening to allow a passageway for the stream of oil to enter the bearings. Here the oil pressure is sufficient to maintain the film between the shaft and the bearings, preventing metallic contact. With this type of bearing it is possible to use a greater clearance at the bearings than with the usual low pressure lubrication and it is claimed that there is no necessity for running-in a new car. That is, owing to the larger clearances and the pressure lubricating and oil cooling arrangements, a car may be driven up to maximum speed immediately without damaging the bearings.

The camshaft front bearing lubrication is by pressure direct to this bearing. The center bearing is lubricated by pressure through the camshaft from the rear bearing, the oil reaching the camshaft rear bearing by pressure from the crankshaft rear bearing. The timing



Upper left—Section through manifold. Lower left—Dry disk clutch. Above—Transmission with control levers and skeleton housing joining transmission to engine

gears are lubricated by overflow from the oil relief and the valve mechanism by oil vapor through the tubes which surround the valve lifters. The connecting rods do not splash. The oil is carried in a pressed steel pan with a capacity of 5 quarts. An oil pressure gage is located on the instrument board in the driving compartment of the car. The oil level gage is mounted on the forward left end of the engine.

Cooling is by the thermo-syphon system in connection with a cellular radiator, having a water capacity of 17½ quarts. The core is hung in the shell, which is removable, and is supported on cross-members of the frame by a steel bar. A motometer is furnished as standard equipment. The fan is a plain bearing, 14 in. type.

The Wagner electrical system is used for starting, lighting and ignition, in connection with a Prest-o-Lite battery. The generator is mounted at the front of the engine, on a swinging cradle, on the right, and is driven by a rubber cord belt from the engine crankshaft. It is driven at 1½ times crankshaft speed. The Wagner relay is mounted on the dash and the starting motor at the right rear of the engine, engaging the flywheel through a Bendix gear. There are 12 teeth on the gear and 122 on the flywheel. The Prest-o-Lite battery has 13 plates and is of 80 amp. hr. capacity. It is mounted on the bracket in a steel box in the frame.

The clutch is a dry plate type with three driving plates lined with molded asbestos composition. The plates

are stud-driven and are pressed together by three springs, all adjustable. The clutch housing is of cast iron and is bolted to the crankcase. The clutch spring has a pressure of 300 lb.

The gearset is a sliding, selective type, providing three speeds forward and one reverse. The speed ratios in the gearbox are as follows: High, 1 to 1; intermediate, 1.82 to 1; low, 3.61 to 1; reverse, 4.5 to 1. The transmission gears are of nickel steel and have ⅝ in. and 11/16 in. faces. The sliding gear is a square fit on the shaft and the countershaft gear is keyed to the sleeve shaft. The bearing mountings are Hyatt high duty, outside of the sleeve gear. At the rear end of the main shaft is a double row ball bearing. The countershaft sleeve shaft and the reverse idler are mounted on rollers.

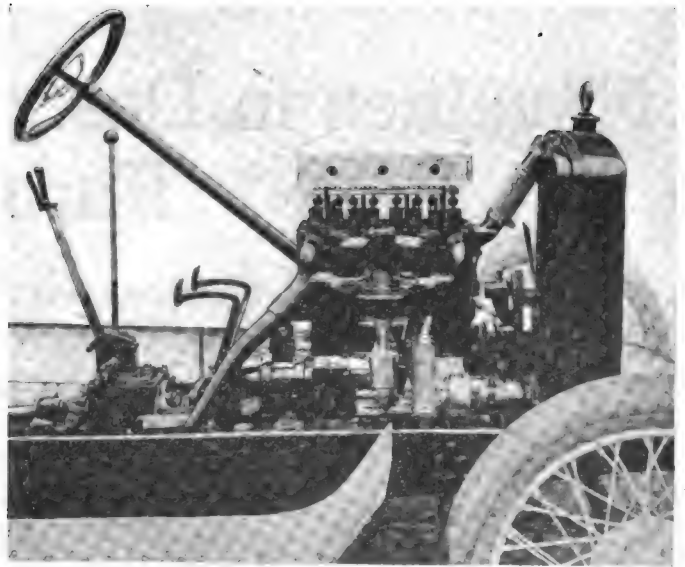
The rear axle is a three-quarter floating, providing a ratio of 57 to 12, or 4¾ to 1. The differential is a four-pinion type and the bearings are Timken at the differential, radial at the drive pinion, double row ball at the front end of the pinion shaft, and radial at the wheels. The housing is pressed steel, reinforced with tubing, while the differential carrier is malleable iron. The pinion adjustment is accessible at the front end, with the gear adjustment accessible by removing the gear cover. The shafts are chrome nickel steel of the six-spline type.

Rear axle torque is taken by a pressed steel torque arm bolted to the rear axle. The connection at the

front end is a ball and socket spring joint. The torque arm ball socket and the front brake eye on the service brake and on the hand brake all act in one plane, so that road action of the rear axle does not set up any brake action.

Steering is by a worm and gear mechanism of the irreversible type. The gear is mounted in a trunnion in the frame bracket. The front axle is an I-beam type. The wheels are 32 in. and of the twelve-spoke type, carrying 32 x 4 in. tires. The car has a chassis wheel-base of 112 in. The brakes are 14 in. in diameter, 2 in. wide, mounted on the rear wheels. The front springs are semi-elliptic, 2 in. wide and 30 in. long, shackled at the rear. The rear springs are 2 in. wide and 40 in. long, of the double cross type; they are seated on a projection of the rear axle brake housing, being shackled at one side to the frame and axle to prevent side sway.

The bodies are built on wood framing with metal panels. The doors are provided with outside bar handles and inside levers. The car has a shipping weight of 2400 lb. and a road weight of 2700 lb. It is priced at \$1785, f. o. b. factory.



Forward end of Saxon chassis

A Gasoline Industrial Tractor

FOR inter-departmental, yard and other short-run work there has been found a growing need for industrial tractors for the purpose of hauling trailers or skids about plants. Vehicles for this purpose must be rugged and built to stand all-day usage. The Towmotor is a gasoline driven industrial tractor brought out for this purpose by the Towmotor Co. It is an all-steel machine built of standard units for the specific requirements of industrial haulage. It is sufficiently large to move freight cars and at the same time is built to accommodate light loads also.

The Towmotor is a 3200-lb. vehicle, with a 60-in. wheel-base and 90-in. length overall. It has a tread of 44 in. and an overall width of 52 in. The turning radius overall is 10 ft. It can operate practically through 7-ft. aisle intersections and has a speed of 1 to 15 m.p.h., controlled by governor. The torque and drive ratios furnish drawbar pull sufficient for handling a trailing load of from 10 to 15 tons under average conditions.

The engine is the four-cylinder Weidely, $3\frac{3}{4}$ by $5\frac{1}{2}$ in., rated at 22.5 hp. The engine is capable of delivering 40 hp. at 2000 r.p.m. The governor is of the centrifugal type, integral with the engine, and fully inclosed. It is adjustable to govern at suitable speeds from 1000 to 2000 r.p.m.,

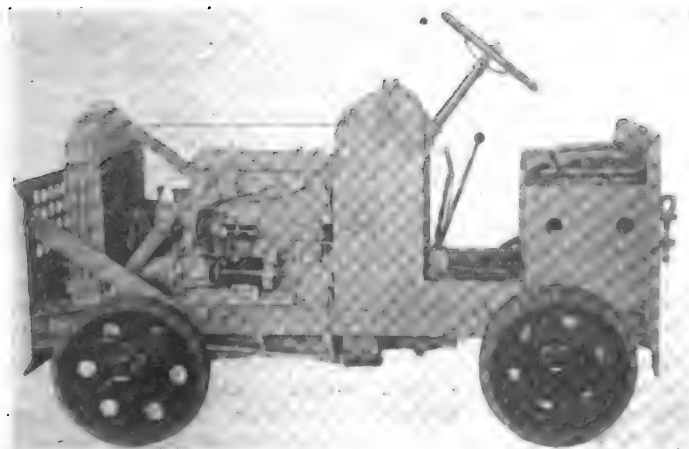
according to plant and load conditions. Ignition and starting is by the Delco system, with Bendix drive.

The clutch is a 10-in. single-plate Borg & Beck type, driving through a standard selective unit transmission gearset providing three speeds forward and one reverse. An alignment joint of the Thermoid-Hardy type is located between the gearset and the rear axle, the latter being a special adaptation of the Torbensen internal gear type of drive. The axle is so arranged that the drive is higher and more nearly on a straight line. The reduction ratio is 8 to 1.

The Elliott truck type of front axle is used, and steering is also on truck lines, with steering connections to the front wheels only. Springs are fitted at the front end only and these are semi-elliptic. The wheels are cast steel disk and the tires solid rubber, pressed-on type, interchangeable front and rear. The front tires are 22 by $3\frac{1}{2}$ in., single, and the rear tires are of the same dimensions, but dual.

The frame is a pressed steel 4-in. channel section, provided with heavy steel plate bumpers, front and rear. Front and rear couplings are of adjustable height to accommodate the load.

Deliveries on the Towmotor have commenced and production is now under way. The price is \$2,150 f.o.b. Cleveland. Optional equipment, costing \$100 extra, is 27 in. wheels.



The Towmotor

Airplane Interiors

A WRITER in *The Aeroplane* states that the most impressive features at the recent Paris aircraft show were in the line of interior decoration. He is not discouraged, however, and says that technical progress will come in time. "Those pink boudoirs are signs that the airplane has really become commercial," he said. "A machine to meet the conditions of the good Monsieur Michelin's price competition, having a speed range of 125 to 6 m.p.h., will be produced sooner or later. Had it actually been produced and exhibited at Paris it would not have impressed the general public one-half as much as the machines with the pink insides."

Novelties in Design of the Sunnyhome Farm Plant

There are several features about this light and power outfit that probably will become popular. Its degree of automatic control, the voltage control, the precautions against damage from freezing and the house that is a part of the original purchase are interestingly described in this article.

SOME novel mechanical ideas are embodied in the design of the Sunnyhome farm lighting and power plant. It is automatic to the extent that, when the charge in the battery runs low, the engine is started to replenish it and when the battery is fully charged the engine is shut down. In addition, when there is anything wrong with the plant, as, for instance, when there is no gasoline in the tank, a red signal light, which can be installed in the kitchen or some other place where it is sure to be observed, will light up. In case of a freeze-up of the piston the main switch opens in three seconds. Voltage control is undoubtedly simple and less expensive than control by an ampere-hour meter.

The Sunnyhome plant is made for 110 volts only, the advantage claimed being that current-consuming devices adapted for 110-volt circuits are to be had at every electric supply store, whereas low voltage-consuming devices are more difficult to get. Besides, with the 110-volt system, it is possible to carry current to a distance up to one mile if desired. For the same drop in voltage and equally close regulation it is necessary to use 12 times the amount of copper in the circuits with the 32-volt system as with the 110-volt system.

Another point in which the Sunnyhome generating set differs from most others on the market is that the engine crankshaft and the generator shaft are separate and are connected by means of a flexible coupling. The crankshaft is mounted on two roller bearings and the generator armature shaft on two ball bearings.

The engine is a single cylinder type of $2\frac{1}{2}$ in. bore and 3 in. stroke. It is rated at $2\frac{1}{2}$ hp., at 2000 r.p.m., while the generator rating is $1\frac{1}{4}$ kw. The cylinder is of the valve-in-head type, the valves being operated through pushrods extending up the side of the engine. A cast iron piston is used and the crankshaft is provided with counterweights for balancing. As already intimated, by the reference to the fuel tank, gasoline is the fuel used. Engine speed is controlled mainly by the load, but in case the flexible coupling between engine and generator should

break, and thus the load be removed, a simple form of suction governor provided in the inlet passage will prevent the engine from racing. Ignition is by the battery and coil system.

To prevent difficulty from freezing of the cooling fluid in cold weather, oil is used for cooling. There is a supply of 5 gal. carried in the base, this serving for both lubrication and circulation through the cooling system. One supply of oil is said to be sufficient for a whole year's running. The oil is circulated by means of a gear pump

and is fed to the engine bearings under pressure. A fan draws air through the generator and radiator, and, after leaving the radiator, the air flows through a passage-way in the top of the house and through shutters in one side thereof. In cold weather these shutters are closed by means of a sylphon type thermostat located within the house. The exhaust air from the cooling system is then discharged inside the house and tends to keep the house at a moderate temperature. As soon as the temperature within the house rises again the sylphon will automatically open the shutters. In extremely cold weather, if the plant happens to be working, it will be automatically started by the thermostat and charge the battery for a



A view of the Sunnyhome Electric Plant

few minutes, when it will shut down.

The house in which the generating plant is located is made of side walls and roof consisting of two sheets of metal with a packing of heat-insulating material in between. A muffler connects to the exhaust outlet through a short pipe and discharges through an opening in the wall of the house.

Reference has been made to the automatic starting and stopping of the set. As with all other small lighting sets, the engine is started by using the generator as a motor, running it on current from the storage battery. However, where generally the starting and stopping of the set are determined by an ampere-hour meter, in the Sunnyhome outfit starting and stopping are dependent upon the voltage of the battery. It is a characteristic of the lead storage battery that as the charge nears completion the

terminal voltage increases and vice versa. Therefore, when the voltage attains a certain value a switch is opened and the plant stops. From this moment on, any load on the circuit will be carried on the battery alone and as the charge of the battery becomes depleted its voltage drops, a switch is automatically closed and the plant is started up again.

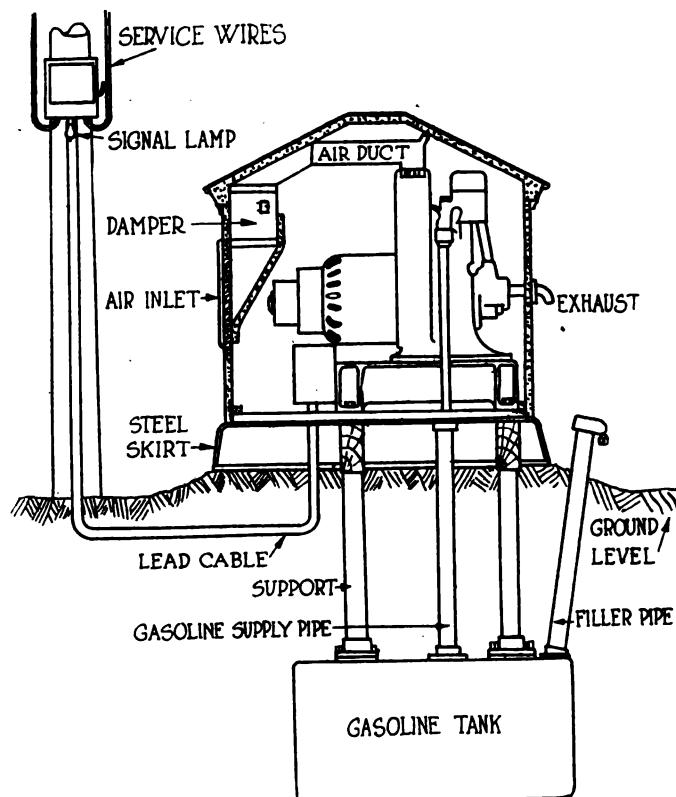
The voltage at the terminals of the storage battery is always somewhat higher when the battery is being charged than when it is discharging and, to render the line voltage as uniform as possible, a booster is cut into the line whenever the battery is discharging and cut out when the battery is charging. A voltage regulation within 3 volts is claimed, except at the moment when the engine is broken loose in starting.

In order to insure the greatest possible reliability as regards starting in cold weather an electric coil is provided inside the carburetor. The coil is located in the mixing chamber beyond the spray nozzle imparting heat to the incoming mixture. Gasoline is forced from the underground tank to the carburetor by means of air pressure, generated by a pump on the engine, and the excess gasoline overflows back into the tank.

The battery furnished with this set consists of 52 cells arranged in two trays, one on either side of the generating set. It is of U. S. L. make and has a capacity of 35 ampere-hours. The cells have hard rubber jars, and these jars are placed in two wooden boxes alongside the generator set base.

The Sunnyhome electric plant will be manufactured by the Sunnyhome Electric Co., of which J. Parker B. Fiske is general manager, D. E. Anderson, designing engineer, and R. D. Puckett, experimental engineer.

This plant is sold with a little house, so that it can be installed outside existing buildings. The installation is made in a way to minimize the work involved. The 75-gal. gasoline tank, made of boiler steel, serves as the foundation of the plant. The tank is sunk in the ground in a 4½-foot hole, which is later filled up with dirt. From the

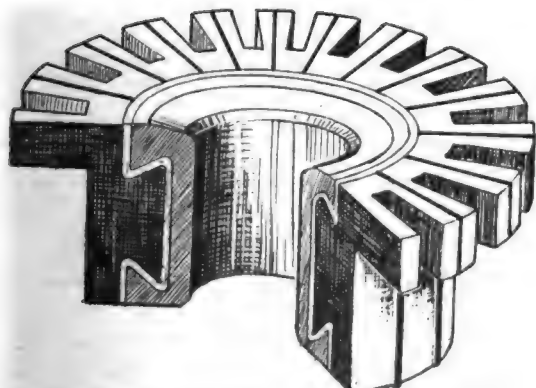


Diagrammatic view showing installation

gasoline tank rise four tubular pillars and two wooden beams are secured to the tops of these pillars. A sheet-metal skirt, giving the effect of a regulation cast iron base, is fastened to the beams, and extends down level with the ground. The house enclosing the plant sets directly on this base.

Improved Commutator Construction

A COMMUTATOR having a one-piece steel core and especially adapted to quantity production has been developed by the Toledo Standard Commutator Co. In an ordinary commutator the segments are held together by a sleeve of steel or cast iron, made with a tapered flange at one end, and a washer and nut, which latter screws over the sleeve at the other end. The place of these various parts is taken in the Standard commutator by a single piece core or holder of soft steel. This core is turned of such shape that the edges of the two conical



Commutator segments secured by steel core

retaining flanges are sufficiently far apart to permit of the commutator bars being inserted. A mica insulation is placed over the core before the segments are inserted, and the core is then compressed endwise so that its conical flanges grip the holding portion of the segments. Compression of the core in a press is effected in three stages. The inward wedging of the flanges of the core into the notches of the segments is accomplished by means of presses and dies. Before the final operation the commutator is baked for 3½ hours at a temperature of 350 deg. Fahr. By this baking all the volatile substances are eliminated, so that after the final closing of the core the commutator is free of all elements that are likely to be changed by the heat of operation. In the final closing process pressure is exerted simultaneously upon the axis of the commutator and radially inward upon the segment.

A special process is also employed for producing the bars from which this commutator is assembled. Sections of the proper length are cut from round copper wire, and these are then rolled into the proper form for the segments, both a longitudinal and a transverse rolling process being employed. The pressure exerted upon the wire in the rolling process has a hardening effect, and is claimed to give a harder and denser bar than is obtained by any other process.

Compact Form of Ignition Set on 1920 Car Models

Some of the features which the Westinghouse company has attempted to combine in its new ignition set are a self-lubricating cam, compactness, efficiency of coil, breaker contacts requiring little adjustment, and a condenser that is said to be indestructible.

A NEW Westinghouse ignition system, designated Type SC, will be fitted to several 1920 car models. Its features are enumerated by the manufacturers as follows: An indestructible condenser, a self-lubricating cam, a highly efficient coil, and breaker contacts that rarely require adjustment and should never need renewal.

This ignition set, which is of the non-automatic, closed-circuit, two-unit type, is suitable for use with 6- and 12-volt batteries and for 4-, 6-, and 8-cylinder engines for all automotive and stationary services. It can be supplied for either generator or engine drive, and a magneto replacement can also be furnished.

The distributor head consists of a base, or cup, which holds the condenser and breaker-mechanism, and a cap, which carries the high-tension contacts. The base is made of cast iron and is covered inside and out with baked-on enamel. It is provided with ventilating openings, which permit the escape of the nitrous oxide, formed by the spark at the breaker contacts, and thus prevents corrosion of the metal parts.

The breaker mechanism consists of two arms; one of which is moved by the cam and the other is stationary. Each arm carries a contact. The movable arm is of special shape, and when operated by the cam, causes the contacts to open and close with a wiping action, which

keeps the surfaces clean and free from pitting. The stationary contact is held in place by a screw, which, when loosened, permits adjustment in three directions and makes alignment with the movable contact a simple matter. The contact points are of pure tungsten and are securely riveted to the arms.

The cam is of special interest. This part is generally made of fiber, steel, or some other metal, and as there is little opportunity for lubrication, unsatisfactory operation is apt to result from wear. The Westinghouse company, therefore, resolved to prepare a material suitable for cams that would not require lubrication, and after a long series of experiments, has produced a compound of graphite mixed with bakelite, which is moulded under heat and high pressure. This material, we understand, has proved to be very satisfactory, and cams made of it have operated thousands of miles on car tests and many hours at high speed on bench tests without showing appreciable wear.

The condenser is encased in a tinned steel box with a close-fitting cover wiped-soldered to the box. The lead wire is heavily insulated at the point where it leaves the box.

The distributor arm is mounted on a bakelite block, which is carried on top of the distributor shaft.

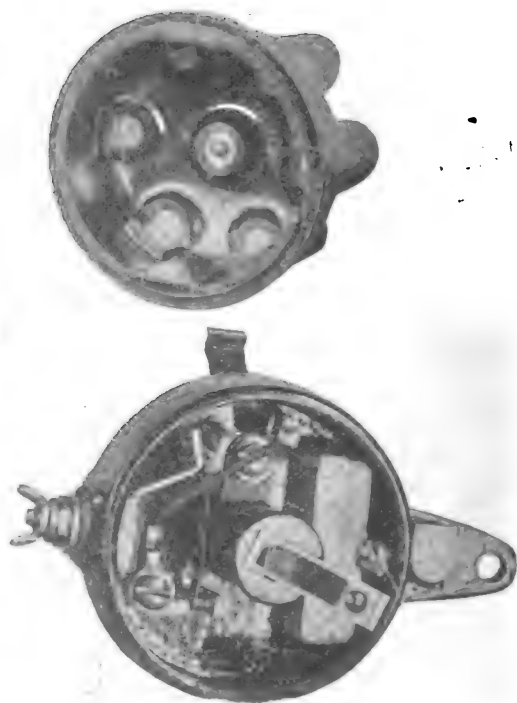
As shown by the illustrations, removal of the distribu-



Westinghouse coil with compensating resistance



Westinghouse ignition unit



Above—Inside view of distributor cap
Below—Interrupter, condenser and distributor block

tor cap exposes all parts for inspection. Each part, including the shaft, can be removed on taking out a single screw. The screws are standard stock and can be obtained at any hardware store. All parts except the cam and the distributor cap are the same for 4-, 6-, and 8-cylinder outfits.

The distributor cap has embedded in it as many brass, thimble-shaped inserts as there are engine cylinders to be supplied with sparks, plus one center one, which is connected with the coil. The bakelite compound is forced around these inserts into the shape of high necks above the top of the cap, so that the cap is one solid piece and has no joints at the bottom of the necks to admit moisture and cause grounds, which may happen when the necks are screwed on. The top of the cap is crowned to shed moisture and a drip mould is provided around the base for the same purpose.

The center contact is a graphite ball spun into a recess in its metal insert. A steel brush on the distributor arm presses continuously against this contact, the spark jump-

ing from the end of the distributor arm to the engine-cylinder inserts in the proper order.

The clips, by means of which the high-tension cables are connected to the distributor terminals, are of ingenious design and can be applied quickly without solder. They make an excellent mechanical and electrical connection, and can be removed and used again without difficulty.

The coil has its windings encased in a micarta tube, with an insulating compound of high melting point poured in to exclude moisture. The mounting base is of steel and the cap is of vitreous porcelain baked in insulating enamel. Both cap and base are put on and set up tight by means of a through bolt when the compound is still hot. Ballast coil is mounted in a groove around the cap.

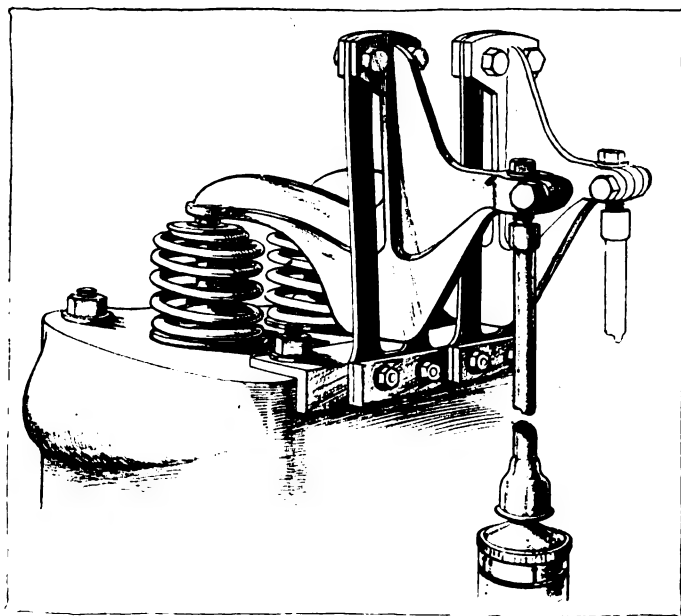
For high-grade cars, where appearance is of importance, this ignition is furnished in a de luxe type. The distributor base casting is made of magnalium and the various parts are copper and nickel-plated and hand-buffed. Two-spark (dual-spark) equipments are furnished in this type.

Straker-Squire Valve Rocker Arm Construction

THE new model of the Straker-Squire 3-5-ton truck chassis embodies an entirely new system of overhead valve gear, in addition to a number of other distinctive features that cannot be dealt with at this time.

As the accompanying illustrations show, the rockers, operated by push rods, have no pivotal bearings of the usual kind, but each is anchored at its upper end to a U-shaped spring which, by its flexibility, allows the necessary angular movement.

The peculiar shape of the rocker will be remarked upon. The downward extension is provided "to give dynamic balance to the upper portion of the rocker, so that there is no lateral acceleration of the rocker as a



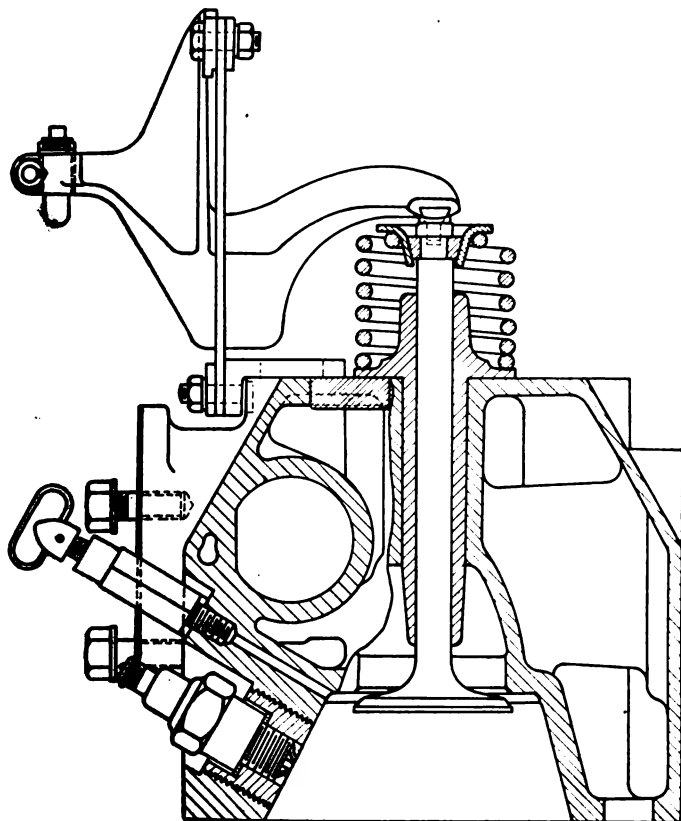
Straker-Squire overhead valve gear

whole." The rocker is wholly supported by the leaf spring; there is no rubbing contact at any point, thus removing the need for lubrication of the overhead details.

The arrangement has, it is claimed, an additional advantage over the usual systems in that the lateral flexibility of the spring allows the end of the rocker in contact with the valve stem to move in a vertical line instead of through an arc. Side pressure upon the stem is thus eliminated and, with it, wear of the stem and guide arising therefrom.

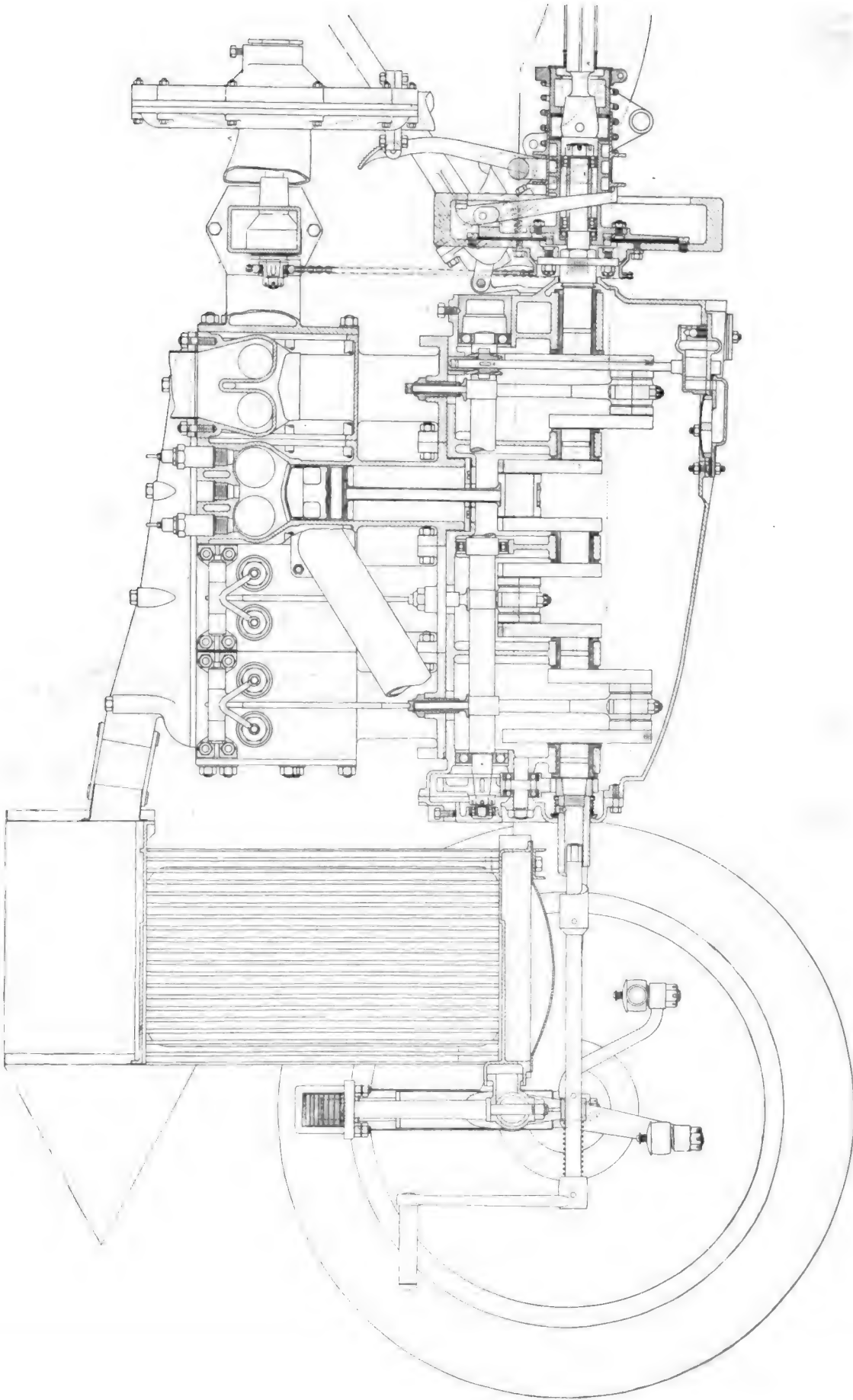
The whole series of springs is bolted to an angle plate that in turn is secured to the detachable head of the cylinder by the holding-down nuts of the latter. All the rockers, therefore, can be removed simultaneously.

The outer end of the rocker is slotted and provided with a pinch bolt to secure the screw with which clearance is adjusted. Normally, the inner arm bears lightly upon the valve stem, the two being kept in contact by the spring blades.



Sectional view of Straker-Squire overhead valve gear

Sizaire-Naudin 183 cu. in. Racing Engine Built in 1912



It will be noticed that this engine has its valves arranged horizontally in the head and operated from a camshaft in the crankcase. There are five bearings on the crank, which is rather light judged by present standards. Ball bearings are fitted on the camshaft

The Design and Construction of the 183 cu. in. Engine

Part 1.

European makers have built many machines of 3-liter piston displacement such as has been made the basis for the racing cars at the Indianapolis speedway this year. This article, which will be continued, analyzes the European practice and points the way for the American builder.

By S. Gerster and W. F. Bradley*

UNTIL 1911, European automobile races had been either for large or for small cars limited only as to bore. This latter rule had been adopted in order to encourage the use of long strokes. With the bore of a single-cylinder engine limited to 3.9 in., the stroke had been gradually increased until Sizaire and Peugeot had each attained 10 in. It was not until everyone was converted to the value of the long stroke and high piston speeds had become common, that the 3-liter or 183 cu. in. rule was adopted.

The first race under this rule was held at Boulogne, France, in 1911, and resulted in victory for Delage, who was pressed hard by Peugeot. The Automobile Club of France, which is the controlling body in that country, was afraid of the small bore and long stroke high speed engines at that time, and left the organization of these races in the hands of Charles Faroux, one of the editors of *L'Auto*. The following year, the club was sufficiently educated to combine a 183 cu. in. race with its Grand Prix, a two-day event run at the same time. The big cars won but, with a distance of 956 miles, there was a difference of only 3 m.p.h. between the Peugeot of 460 cu. in. and the big

*Mr. Gerster is an eminent French automotive engineer and designer, and Mr. Bradley is European correspondent for AUTOMOTIVE INDUSTRIES.

Fiat of 920 cu. in., and the diminutive 183 cu. in. Sunbeams. It was the most conclusive demonstration of the possibilities of the small engine that motordom has ever seen, and, although the national club did not adopt the 3-liter rule immediately for its Grand Prix race, the lesson was not lost. Had there been a French Grand Prix this year, it would have been for 183 cu. in. cars. The rule will be adopted, however, in 1921 and, in the meantime, Indianapolis has taken it up for the 1920 race on the Hoosier track.

The 183 cu. in. rule had the effect of inducing engineers to work on the problem of obtaining the highest power from an engine of a given capacity. It is rather strange that the 1912 race was won by cars that had the least departures from standard practice ever seen in racing machines.

The 1912 race at Dieppe was won, in the 183 cu. in. class, by Sunbeam cars, which took first, second and third places in their own classes and were beaten only by one Peugeot and one Fiat in the open event. There were other 183 cu. in. cars of higher power and more advanced design but they were inferior in speed to what may be called the standard Sunbeams. This can be accounted for by a lack of preparation. Among them were the first 3-liter

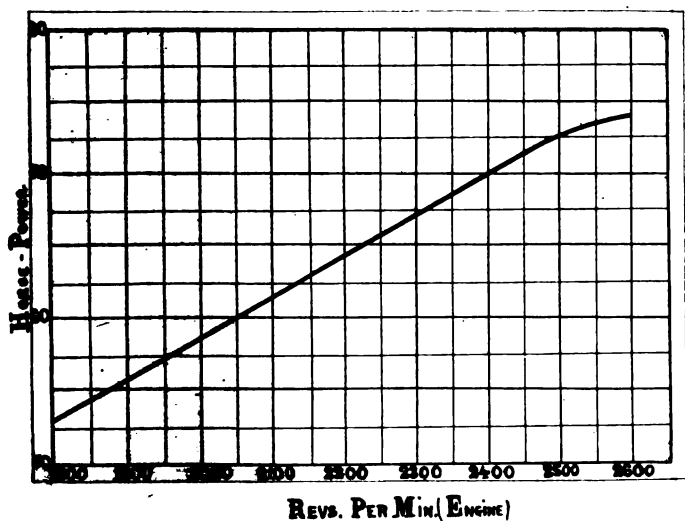


Fig. 1—Power curve, Sunbeam racers

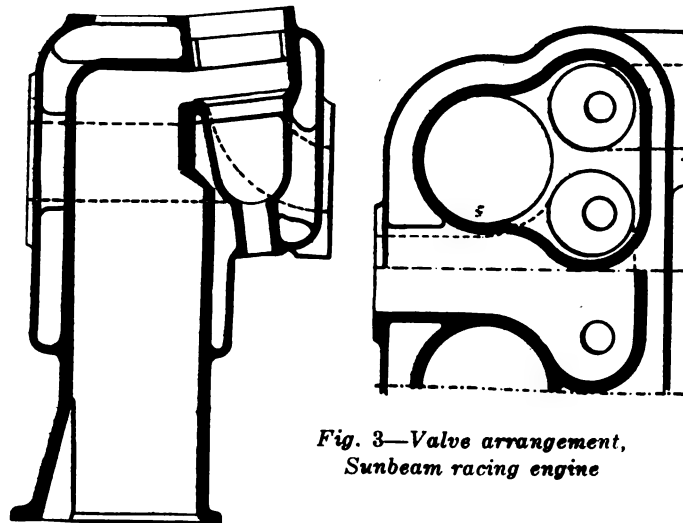


Fig. 2—Cylinder, Sunbeam racing engine

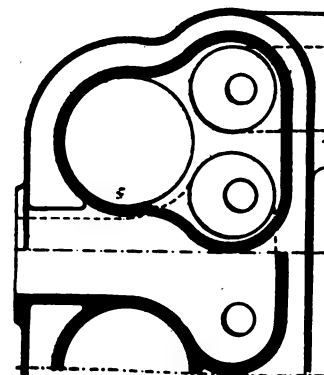


Fig. 3—Valve arrangement, Sunbeam racing engine

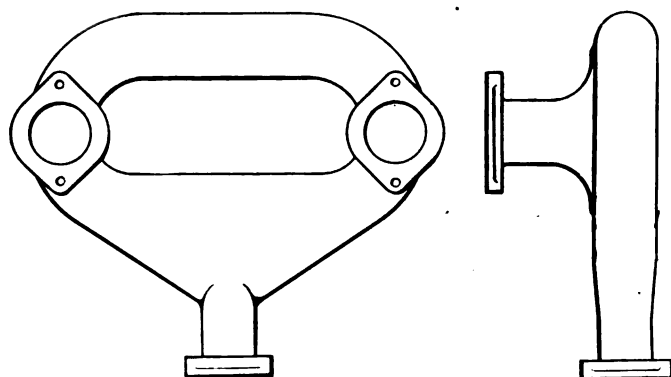


Fig. 4—Intake manifold

Peugeots. Of the same general design as the big car which won the open event, they were defective in several of their details and were not a complete success until the following year. By that time they had been modified and had become the most successful racers in Europe. It was one of these 1913 Peugeots, modified from the 1912 designs, which was run at Indianapolis in 1914 by Duray, when it won second prize against machines of twice its piston displacement. This was the first appearance of a 183 cu. in. racing car in America.

The Sunbeam engines were the simplest entered in the French 1912 race. It is certain that they developed the maximum power obtainable from engines of the L-head type. The cylinders, which were a single casting, measured 80 x 149 mm. (3.15 x 5.87 in.) and the power developed was 74 hp. at 2600 r.p.m., as shown on the accompanying curve (Fig. 1). The piston speed was:

$$V_p = \frac{n \times c}{30} = \frac{2600 \times 0.149}{30} = 12.9 \text{ meters/second (2540 ft. p.m.)}$$

The volume of charge drawn in per horsepower per minute is as follows:

$$V_1 = \frac{S^1 \times V_p \times 60}{n} = \frac{0.5026 \times 12.9 \times 60}{74} = 52.5 \text{ liters}$$

(3203 cu. in.). This figure is practically the same as that of the racing Peugeot and indicates a higher efficiency for the Sunbeam than for other engines of that period.

The volume of the compression space was 153 c.c., giving a compression ratio of 5.9 to 1. Gage measurement during a test gave 100 lb. p. sq. in., which was a great advance on the results obtained before 1912. The horsepower per liter of cylinder volume was

$$N = \frac{74}{3} = 24.6 \text{ hp.}$$

or, for each cubic inch of piston displacement, the engine developed 0.404 hp. The form of the cylinder and of the combustion chamber are shown in Figs. 2 and 3. The engine was fitted with a Claudel-Hobson C. Z. 38 carbureter and had a gas velocity at the throttle of

$$V_s = \frac{S^1 \times V_p}{f} = \frac{0.5026 \times 12.9}{38} = 44 \text{ meters/second (8640 ft. p.m.)}$$

The intake manifold, shown in Fig. 4, was of an unusual shape, being designed to give a circular motion to the mixture, with two ports into each pair of cylinders opening out from the loop of the outer edge. This pipe, which was warmed by the circulating water, had a diameter at the inlet of 45 mm. and the section of the pipe was 50 mm. The velocity of the gas in the pipe was

$$V = \frac{0.5026 \times 12.9}{0.195} = 33 \text{ meters/second (6480 ft. p.m.)}$$

This arrangement gave complete satisfaction, but the results were obtained only after a very long series of careful tests carried out on the road under the direct supervision of Claudel and Coatalen.

The valves, as shown in Fig. 5, were a special tulip type with hollow head and the underside of the head was specially shaped to give a high volumetric efficiency. The lift was 9.5 mm. and the pressure of the valve spring, with valve opened, was 150 lb. The rate of the spring was 115 lb. p. in.

The crankshaft, which was carried in three plain bearings, had a diameter of 48 mm. It was lightened from the standard type and was made of chrome nickel steel, being balanced accurately during manufacture.

The pistons, shown in Fig. 6, were of original design. They were specially lightened from the steel bar and had a support in the crown to the piston pin. This made it possible to have the head much thinner than otherwise without danger of overheating the head. The skirt was lightened by drilling. The connecting rods were of special nickel chrome, made from forgings, machined all over to a light H-section, which was further lightened by drilling. The connecting rod bearings were lined with white metal run directly into the rods. The cams necessarily were of special shape that gave an increased lift and more rapid opening and closing. The operation of the valves was by means of standard roller tappets.

Great Advance Since 1912

Good as it was in 1912, an engine of the Sunbeam type would have no chance of coming home first in a 1920 race. Since that car was run, piston velocity has increased enormously, mechanical efficiency has been increased, and the power obtainable from an engine of this size has gone up from 72 to more than 100.

When the first 183 cu. in. rule was applied, no mention was made of forced induction. That was an oversight on the part of the organizers of which manufacturers tried to take advantage. The Hispano-Suiza company built engines with two-cylinder compressors to pump the charge into the main cylinders. Various difficulties were experienced and the cars did not start in the race. Sizaire Bros. worked on the same problem and, with a 3-liter engine of 78 x 156 mm., succeeded in obtaining 96 hp. They found it impossible, however, to make any plug stand up for more than three minutes. During the following year, forced induction was forbidden and the experiments dropped. The Indianapolis rules for the present year are also silent on forced induction.

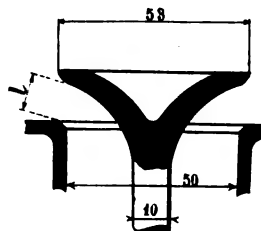


Fig. 5—Tulip type valve used on Sunbeam racing engine

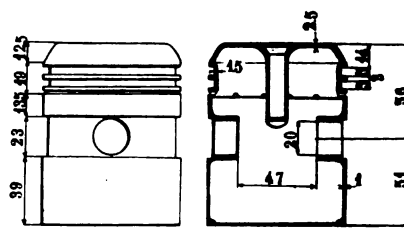
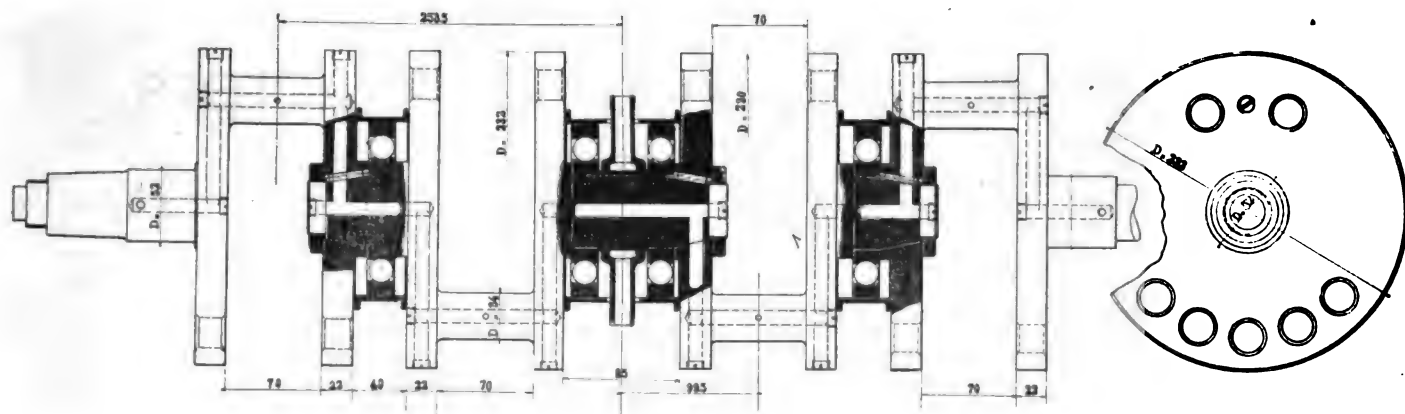


Fig. 6—Sunbeam racing piston, with support in the head

Undoubtedly the best racing results could be obtained with a 2-cycle engine. Such an engine would cost much more to produce than would one of the 4-cycle type. It would have to be built without baffle and with special attention to the intake piping and the intermediate tanks. Although difficult to construct, such an engine is possible of realization and could be guaranteed to develop 190 hp. at 3500 r.p.m., with a gas consumption equal to 14 miles



to the gallon. At present, however, the 2-cycle is not attracting much attention and it is almost certain that none will be seen at Indianapolis.

For racing purposes the best dimensions of a 183 cu. in. engine are 78 x 156 mm. and these dimensions will be adopted by all European contestants. Other possible dimensions are 80 x 149, 85 x 132 and 90 x 118. With piston strokes of 118 or 132 mm., it is impossible to get sufficiently high linear piston velocities necessary for success in racing. With an engine of 78 x 156 mm., a piston velocity of 19 meters/second (3600 ft. p.m.) can be obtained, this being the highest linear piston velocity with the lowest rotational speed. This velocity of 19 meters/second has already been attained, and figures even run as high as 21 meters/second (4140 ft. p.m.), but at this speed the peak of the power curve had been passed.

With this engine, having a piston velocity of 19 meters/second, the number of revolutions will be

$$n = \frac{30 \times V_p}{C} = \frac{30 \times 19}{0.158} = 3650 \text{ r.p.m.}$$

The volume of gas drawn in per hp. min. will be

$$V_1 = \frac{S^1 \times V_p \times 60}{W} \text{ or } W = \frac{S^1 \times V_p \times 60}{V_1}$$

Regarding the coefficient of efficiency V' , it is known that the best engines in 1912 obtained $V' = 52$ liters per hp. min. and the Sunbeam obtained $V' = 52.5$.

Admittedly much can be gained by engines with four valves in the head and combustion chambers of much better form than was found on the L-head engines of 1911 and 1912. Thus, V^1 can be brought down to $V^1 = 48$, and the horsepower obtainable will be

$$N = \frac{S \times V_p \times 60}{V'} = \frac{0.48 \times 190 \times 60}{48} = 114 \text{ hp.}$$

Other persons are more modest in their estimates and do not count on more than 108 hp. from the 1920 183 cu. in. engines. From 0.404 hp. per cu. in. in 1912, the power will thus have gone up to 0.623 hp. in 1920.

The compression will probably be more than 90 lb. and in some cases will run up to 100 lb. The volume of the combustion chamber will be

$$v = \frac{V}{p-1} = \frac{750}{6.3-1} = \frac{750}{5.3} = 142 \text{ cc.}$$

and

$$\frac{V}{r} = \frac{750}{142} = \frac{1}{0.189}$$

The mean effective pressure of such an engine will be

$$P = \frac{t \times 75 \times N}{S \times V_p \times N_s} = \frac{4 \times 75 \times 114}{48 \times 19 \times 4} = 9.4 \text{ kg./sq. mm.}$$

(133 lb. p. sq. in.) The horsepower per liter of cylinder area will be

$$N = \frac{144}{3} = 38$$

(133 lb. p. sq. in.) The horsepower per liter of cylinder area will be $\frac{144}{133}$

$$N = \frac{114}{3} = 38$$

The gas velocity at the carburetor outlet will be from 58 to 65 meters/second (11,400—12,800 ft. p. m.), but this will be influenced to a certain extent by the nature of the road or track on which the car is intended to run. The intake manifold will be determined by the nature of the valves but will be as short as possible and will have the greatest possible amount of water jacketing.

Probably the majority of this year's engines will have cast iron cylinders, although there is no reason why steel cylinders with a welded jacket should not be used, or aluminum cylinders with a steel liner. In all cases, the engines will have four valves per cylinder mounted in the head and generally operated by a couple of overhead camshafts. In view of the high engine speeds to be obtained, valves and valve followers, if any are used, will be as light as possible.

Method of Driving Camshaft

The most popular method of driving the camshafts will be by means of a train of spur gears, as used on the Peugeot engines first designed by Engineer Henry. This system of camshaft drive was introduced by Henry in 1913, after he had built his first Peugeot racing engine with bevel camshaft drive. The spur pinion type, with the idlers mounted on ball bearings, proved so successful that it was continued on all later Peugeots, and, when Engineer Henry joined the Ballot company, on the cars of that firm. Others have also copied this feature.

The general tendency will be to incline the valves in the head and to use a single spark plug placed in the center of the four valves. Some designers, however, are showing preference for four horizontal valves operated from a couple of camshafts in the crankcase. Experiments have also been made with eight valves per cylinder. With the four-valve arrangement, it is difficult to find room for more than one plug, but tests have shown that, with plugs on opposite sides so timed that the inlet side plug has a lead on the exhaust side one, an appreciable increase in power can be obtained because of more rapid combustion.

There is no indication that positively opened and closed valves will be used. They were employed before the war, but the results obtained were not equal to expectations. As an indication of timing which may be expected on these engines, the following may be taken: The exhaust valve will open with a lead of 60 deg. and will close 10 deg. late.

(Continued on page 764)

The Plowing Speeds of Tractors and the Variables Involved

In this article, Mr. Zimmerman seeks to throw light on the problem of ascertaining the most economical rate for plowing, considering the many factors that enter into the computation. The subject is considered not only from the standpoint of the manufacturer but of the farmer as well.

By Oliver B. Zimmerman*

AMONG the problems before the designers of plowing tractors, none is of more importance than that of selecting the plowing speeds. As the variables involved are numerous and elusive, only by careful analysis and experiment can we ascertain their relative importance and make a proper deduction.

The problem is to ascertain the most economical plowing speed for first-class work, and the solution must be right from the standpoint of the manufacturer as well as from that of the farmer. This means that we must consider a variety of soil resistances, widths and depths of cut, forms or shapes of plows, etc. In this review most attention will be devoted to the question of what happens to the power delivered at the draw bar and it will be necessary to assume certain standard conditions.

First, let us take a high angle view of the situation, in order to simplify our analysis, using two well-designed outfits, developed to travel at 2 and 4 m.p.h. and to draw four and two bottoms respectively. If we assume for the moment that the draw-bar horsepowers are equal and the acreages plowed in the same time are equal, the following conclusions can be drawn:

(a) The tractor must move itself and the plows over

*Paper read at the S. A. E. tractor meeting at Kansas City, Mo., Feb. 19. Mr. Zimmerman is of the International Harvester Co.

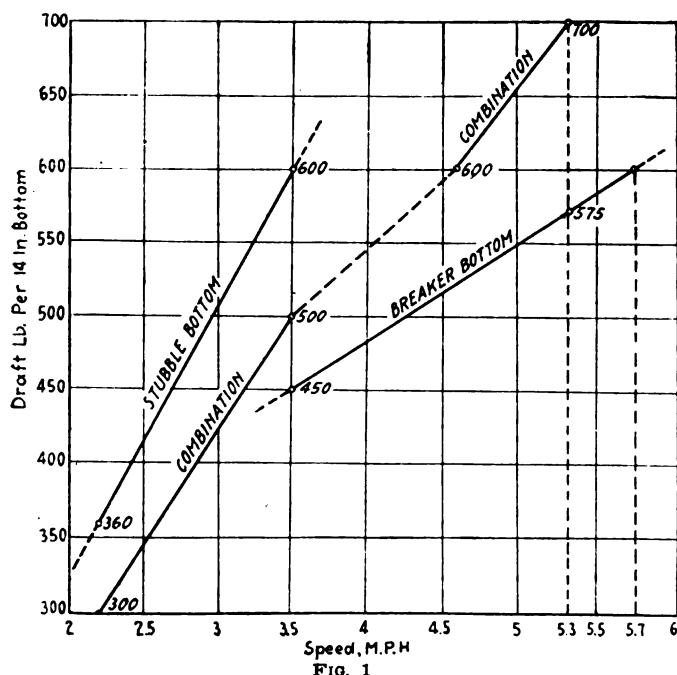


FIG. 1

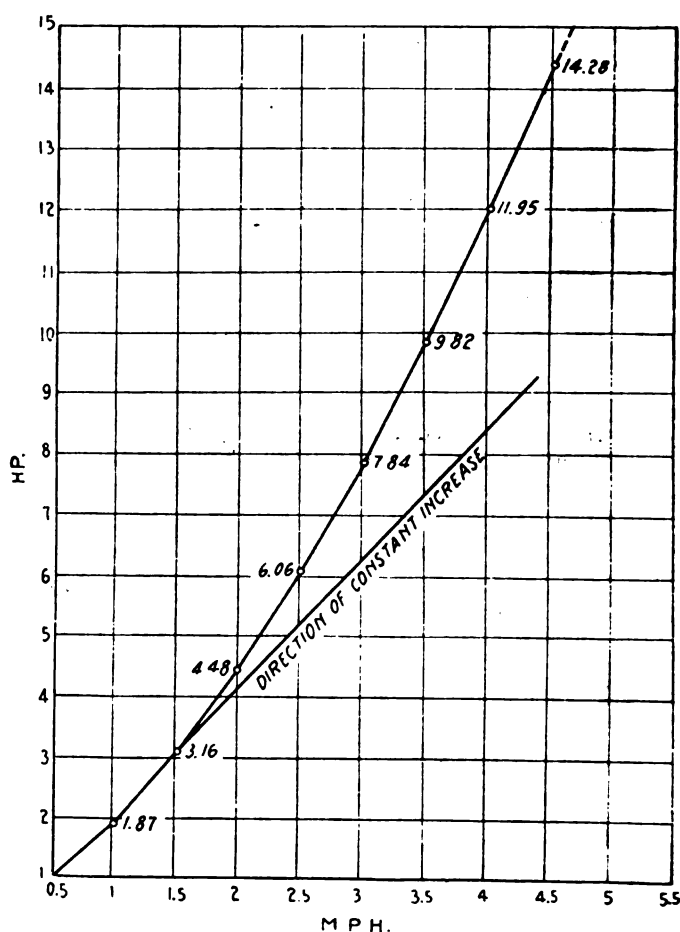


FIG. 2

the ground twice as far in one case as in the other.

(b) The number of turns at the end is twice as great in one case.

(c) The strains due to striking hidden obstructions are greater at the higher speed.

These are the factors which, in the main, require more horsepower ahead of the draw bar at the higher speeds as well as proper care in design.

Next let us consider what occurs to the rear of the draw bar. Here we shall assume, in order to cover a reasonable variety of soil resistance and number of plows, that we have a draw-bar horsepower of 15 available. We shall assume that for each speed from one mile per hour up to five or six the engine and tractor are properly designed for the speed considered and of equal fuel economy

per horsepower above and below each mile of speed, so that the merging shall be complete and uniform from one into the other and the comparison as fair as possible.

As for the basic data we shall use the recently published draft data of Professor Davidson of Ames, Iowa, and that of the Kansas State Agricultural College, as these tests are in complete agreement with experimental data developed by experienced commercial organizations in the past and used by them in present-day designs. The data mentioned in general indicate that in each kind of soil, whether heavy or light, with the increase of speed there is a corresponding increase of draft, the amount dependent on the speed, shape of plow and nature of soil.

Referring to Chart I, the plows show a uniform increase in draft with increase in speed. In other words, the draft is represented by a straight line. The combination bottom was experimented with at two speed ranges. Bear in mind that the soil resistance is very small in these Kansas tests. It is shown that with a stubble bottom in light soil, an increase of 1.3 miles above 2.2 miles carries a draft increase of 240 lb., or 59 per cent increase speed causes a 75 per cent increase in draft. With the combination bottom a 59 per cent increase in speed causes a 66 per cent increase in draft. With the breaker bottom, a 63 per cent increase in speed (3.50 to 5.7) causes a 33 per cent increase in draft (450 to 600).

The deduction is that with an increase in speed there is a proportional increase in draft; also that the less abrupt moldboard has the least resistance. The same is shown in Professor Davidson's data (see Chart II) where an increase in speed from two to four miles, or 100 per cent, causes a draft increase of 33 per cent.

Horsepowers Required

Let us next take up the horsepower required and translate the factors of speed and draft into power. It will be noted that not only must we accomplish the work due to the added speed, but in addition we must take care of the

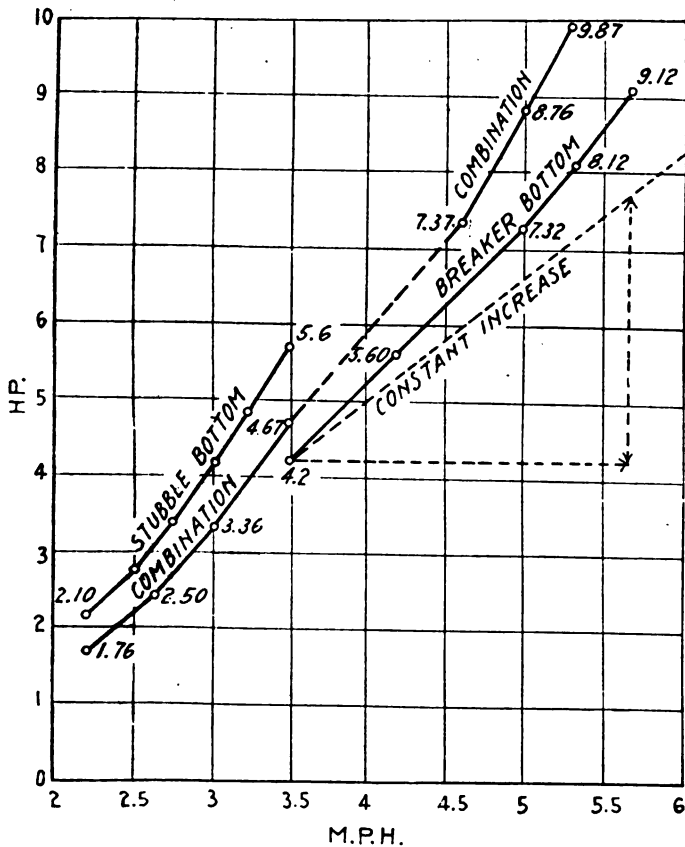


FIG. 3

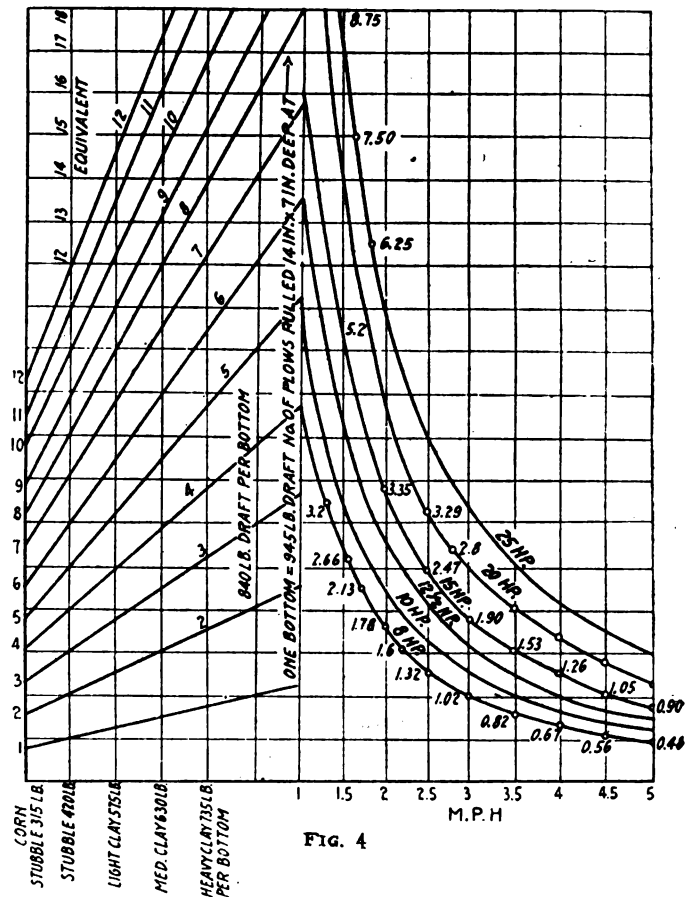


FIG. 4

added percentage of draft. Hence, we find that increasing the speed 100 per cent, from 2 to 4 m.p.h., requires an increase in horsepower of 267 per cent, from 4.48 per plow to 11.95.

Chart III is a diagram of horsepower required, illustrating the relations for the Kansas tests. Chart IV was developed from the tests giving a comparison of various sizes of tractors operating at various speeds and in soils of various resistances. Data was obtained by determining how many plows the tractor would pull at the various speeds.

By cross-reading from any given soil resistance at the left and from a point indicating the number of plows, the speed at which they can be pulled is shown on the curve (575 lb. soil resistance at 2 miles—4 plows—15 hp. curve—reads 2½ miles).

Likewise a given tractor speed followed to the curve, then to the left intersecting a vertical line, records the full number of plows that can be pulled in that soil (2 miles—10-hp. curve—630-lb. soil resistance at 2 miles, 3 plows).

Acres Plowed per Day

With the data plotted in the previous charts, based on careful tests in light soil, we are now enabled to diagram the acreage plowed per hour by the tractor at various speeds and in various soils (Chart V). By calculation, the curve, swinging down and to the right, represents the curve of the maximum area or acreage which can be turned economically at the speed shown, in the soil indicated and with the designated 15 hp. Intersecting this curve are various radial lines designating the path on the field of various numbers of plows cutting 14 in. width.

The saw tooth lines indicate the following:

A 15 draw-bar horsepower engine, in this soil, starting at 2 m.p.h., would begin by plowing at the rate of 2.2

acres per hour. The acreage would increase with increase of speed up to 2.50 acres per hour, when a speed of about $2\frac{1}{4}$ miles has been reached. At this point the draw-bar horsepower has reached 15 and we drop off a plow, continuing with seven plows, from 2.20 acres. Again as the speed advances the acreage increases until the seven-plow line cuts our maximum when another plow is dropped, and so on.

Let us now consider that we have three tractors at work under the same conditions and draw-bar horsepower, operating 3, 4 and 5 plows, respectively (C, D, E), at such speeds as will cause each to plow 1.47 acres per hour. What can we see from the location of these three points:

First—The 3-plow rig is working nearer its maximum than the 4 or 5, since the distance from the maximum is increasing; in other words, C, D and E are not requiring 15 draw-bar horsepower and the 5-plow outfit is using the least horsepower of the three, to plow the same acreage in the same time.

Utilizing the full 15 db. hp., the acreage is in the relation of 3 plows, 1.54 acres.

4 " 1.78 "
5 " 1.97 "

Again, taking point F, a 2-plow outfit operating at four miles covers 1.13 acres while the same outfit fitted with 8 plows would cover, at 2 miles, 2.22 acres or nearly 100 per cent more acreage.

The maximum condition using 15 db. hp. with 2 plows 1.25 acres, while with 8 plows we have 2.48 acres—approximately 100 per cent more acreage.

It is, of course, admitted that this diagram does not compensate for increased weight drawn of the 8 bottom

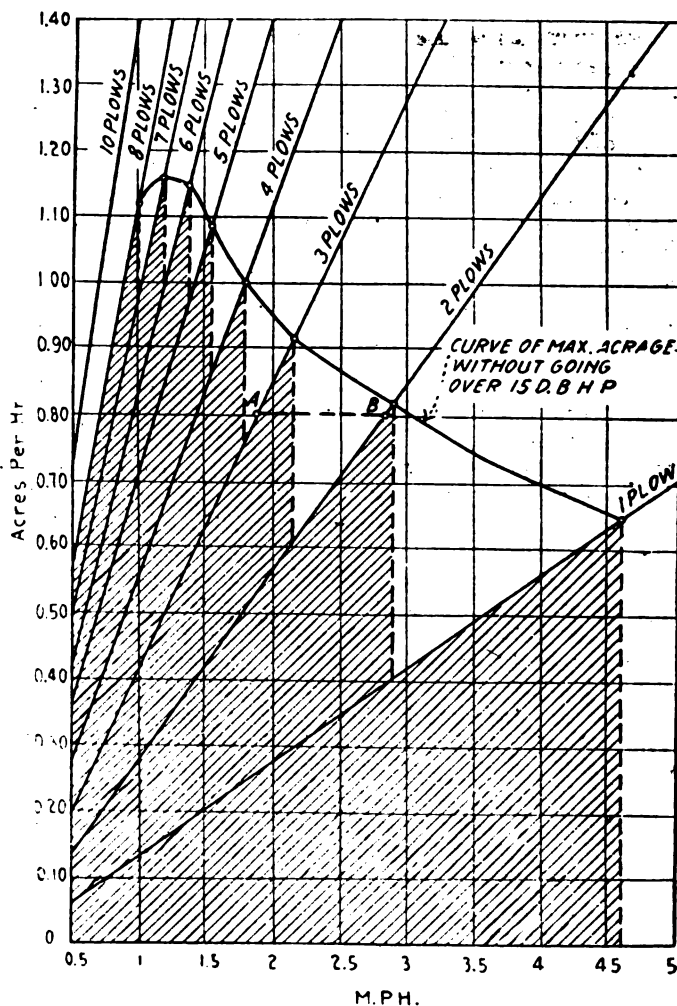


FIG. 6

over the 2, nor for the fact that the plow shape is not correct for the widely different speeds; nevertheless, it is positive that as we decrease the comparative speeds so that the two are only small percentages above and below the designed speed for the plow and conditions, same relation holds true. The corrections mentioned would tend to reduce somewhat the acreage at the lower speed to an extent covered by the power absorbed in hauling the added weight of the greater number of plows over the ground, and the greater speeds would reduce the available plowing energy.

Where heavy land is under consideration we have much the same conditions met and analyzed. It is clear from both Chart V and Chart VI that the acreage plowed decreases markedly with increase in speed, to such an extent that correction in moldboard design or reductions in weight cannot overcome the deduction—that the lower speeds are more desirable than the higher speeds. It is also clear that time is not gained by high speeds; in fact time is lost.

Occasional analysis of field demonstrations has led to wrong conclusions because of the fact that the machines compared are not being compared on an equal basis, a condition quite impossible to attain except theoretically as shown. Let us take two cases to illustrate this in heavy land:

Engine No. 1 pulling 3 plows in low gear at 2.2 miles covers 0.92 acre.

Engine No. 2 pulling 2 plows in plowing gear at 2.75 miles covers 0.80 acre.

Engine No. 1 pulling 2 plows in plowing gear at 2.75 miles covers 0.80 acre.

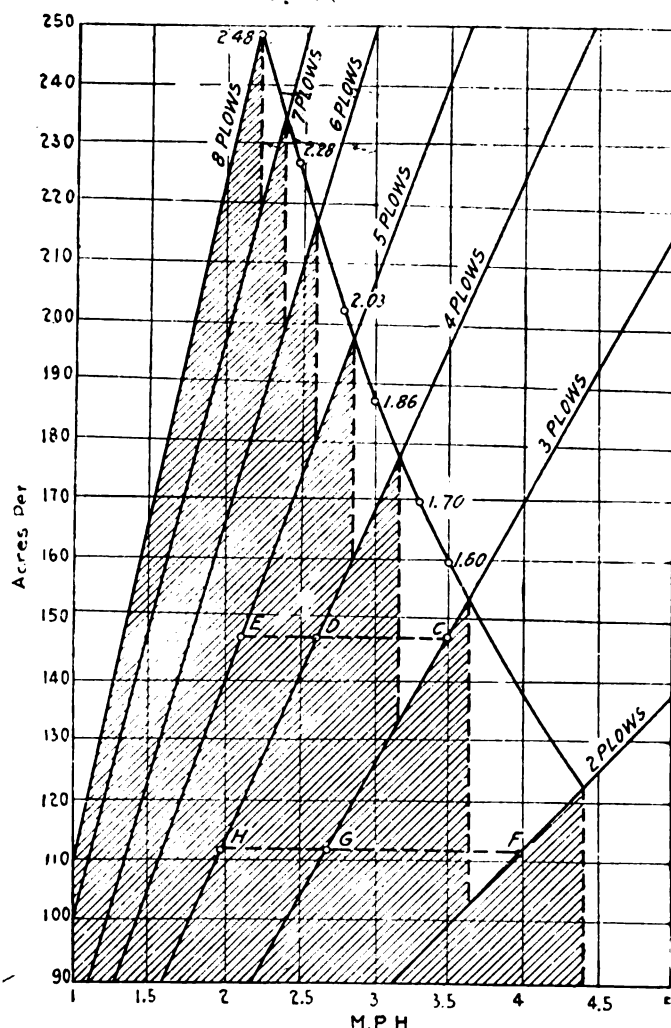


FIG. 5

Engine No. 2 pulling 3 plows in low gear at 1.75 miles covers 0.75 acre.

This shows that the ability to win, say in a plowing contest, is dependent on the relations which exist at the time, not necessarily of the efficiency of the engine and outfit, but the relations of the possibilities of adjusting the speed and number of plows so as to operate close to the line of maximum acreage.

In the above case the low speed wins once and loses once, but if a speed of 3 miles or over were attempted by either tractor in this land it would be unable to pull more than one plow. Similar comparisons on Chart V are more in line with experience, as the deductions are clearer, though this soil resistance is less than usually obtains. Chart VII combines the various acreages with the different bottoms in one diagram.

Aside from the correct answer to the proper plowing speed, there comes up the question of desirable speed for hauling equipment such as threshers and wagons over the road, the drawing of mowers, binders, and similar farm equipment in operation. The answer to this question is outside of our discussion. To be sure, new apparatus could and will be designed for higher speeds, but it must be evident to those with experience that the percentage of increase in economic workable speeds cannot be far from those deduced from this analysis.

Chart VIII is based on cost data in conformity with tractor experience, as follows:

- (1) First cost of 25-hp. tractor, plows, tanks and supplies—constant \$2,500.

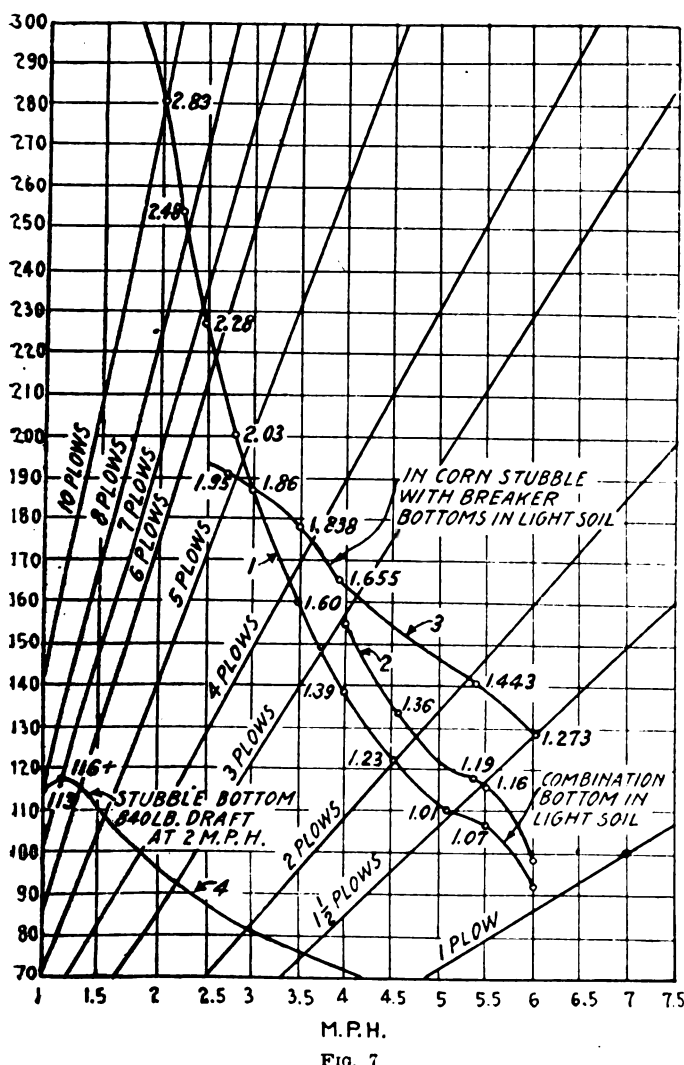


FIG. 7

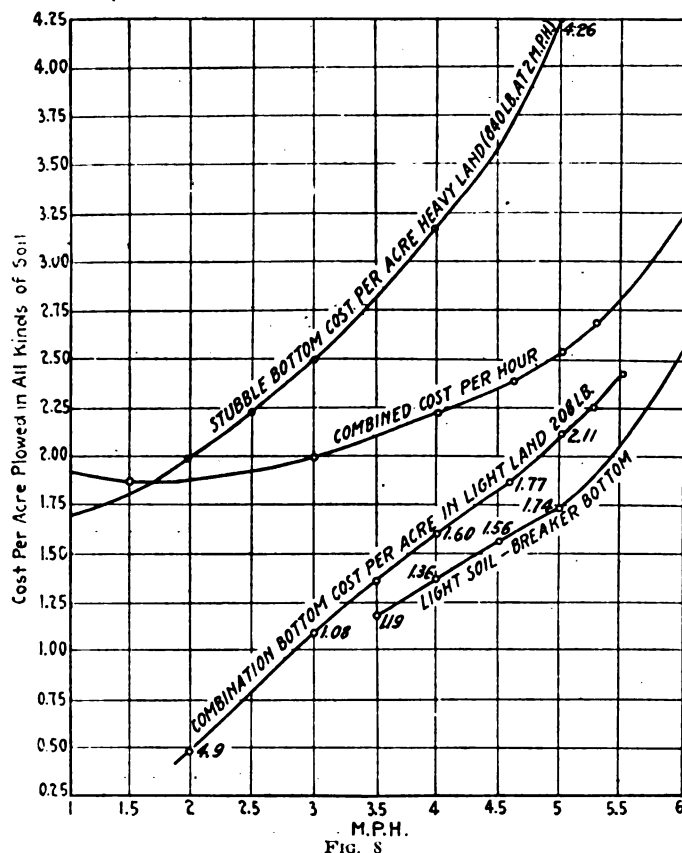


FIG. 8

- (2) Interest on the investment—5 per cent.
- (3) Depreciation on the basis of $8\frac{1}{2}$ years at two miles to 6 years at four miles.
- (4) Repairs—on an increasing rate from 6 per cent at two miles to $8\frac{1}{2}$ at four miles.
- (5) Labor—40c. per hour and 30c. per hour for helper on tractors of over four plows.
- (6) Fuel and lubricant at market prices, on the basis of 5 per cent increase for each mile per hour speed increase and 65 per cent transmission efficiency at the draw bar.
- (7) Hours of operation to be figured at 500 per year. (U. S. Government records).

It is clear here that the cost rises rapidly with the speed.

The same facts have been used in Chart IX, introducing the two-man operator feature and charging actual cost of plows used, engine and equipment as compared to the constant cost illustrated in Chart VIII.

In Chart X are combined a complete development of draft curve, horsepower curve, and number of plow curve with relation to miles per hour.

From the above we can draw the following conclusions:

- (1) The most economical plowing speeds are unquestionably below 3 m.p.h., the cost rising rapidly from around 2 m.p.h.
- (2) None of the variables which have been left out of this discussion can enter into the question to a degree which will overcome the evidence indicated by these charts.
- (3) If plows were designed specially for higher speeds, the best that could be expected would be a less pronounced increase in costs, and in no case could the speed of maximum economy be raised to over 3 m.p.h.
- (4) It is evident that the better breaking up of the soil at the higher speeds is heavily paid for and

that it is more economical to perform the operation of harrowing, either separately or behind the plows than to try to accomplish it by rapid plowing.

- (5) To attain the very best results, speed ratios should cover the ranges from $1\frac{3}{4}$ to 3 m.p.h. This would permit of meeting the various soil resistances (see Chart IV).
- (6) From Chart VI it would appear that in heavy land and plowing up to 8 in. deep with small tractors, greater acreage would be attained by the use of 10-in. or 12-in. bottoms than of 14-in., since more of the saw tooth points will meet the economical acreage curve. A better adjustment of cutting width is also possible.
- (7) The time required to plow one acre can be tabulated from these tests with relation to the number of plows pulled, as follows:

Number of Plows.	Heavy Land, Hours.	Light Land, Hours.
2	1.212	.643
3	1.095	.565
4	1.000	.506
5 .....	.926	.462
6 .....	.....	.426
7 .....	.....	.400

- (8) The low limit of plowing speed is obviously that which will permit of scouring of the moldboard. This speed will be dependent on soil conditions. The proper moldboard is assumed to have been chosen, i.e. one whose abruptness and scouring qualities are correct for the various conditions to be met.
- (9) The cost curve for two operators at low speeds and with five or more plow bottoms can be further cut by using power lift equipment, when one man can operate up to eight bottoms.

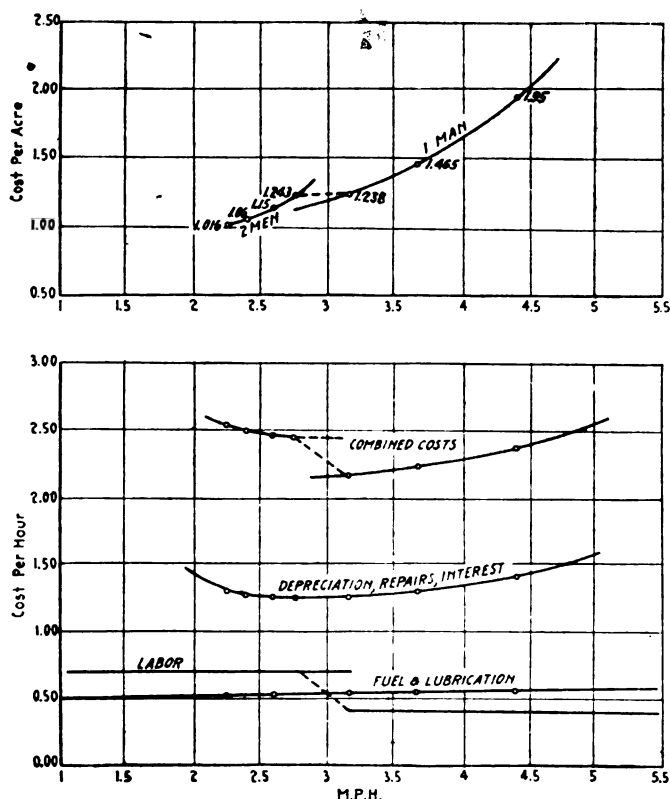
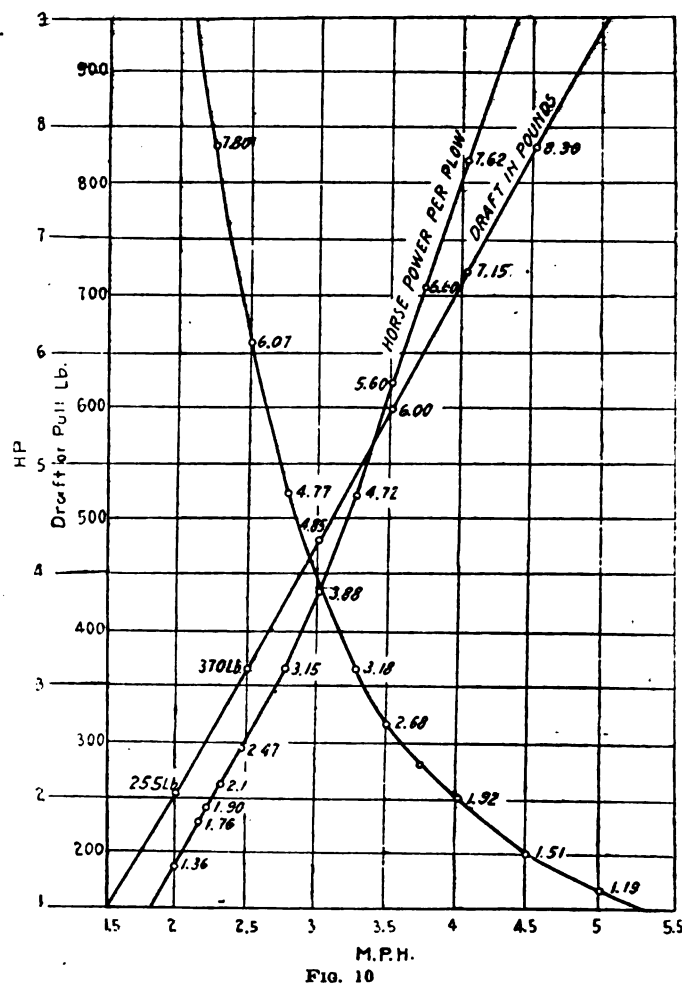


FIG. 9



Motorizing the Farm with Tractor, Cultivator and Truck

The tendency of tractor builders to add trucks to their lines is noted in this article, which gives also the figures of a recent incomplete governmental attempt to take a census of the farm-owned trucks in this country. The total of 50,000 such machines, however, is considered too low.

IT became known at the recent Kansas City show that several of the tractor manufacturers had completed plans for building trucks as a sales complement for the tractor and implements. This policy follows the belief that the motorized farm should have:

A tractor; a motor cultivator; a truck.

With this equipment a considerable part of the heavy farm work is motorized. Some persons who have been keeping in close touch with farm developments suggested that, in addition to the motor equipment mentioned, the farmer should have one of the garden cultivators for use in the truck patch and other small work. This suggestion usually brings a debate, as some of the foremost tractor engineers are not ready to declare for the horseless farm. As one of them said to AUTOMOTIVE INDUSTRIES:

"I am not planning for the horseless farm, because I firmly believe that a horse or horses will always find a home on the farm, through sentiment if for no other reason. But we have not yet solved all of the problems of the farm. There is the hay and wheat hauling, for instance. The motor cultivator is useful for this work, but the tractor is too heavy and is needed for threshing power. The truck, however, is certain to come."

This brings the question back to the truck and the farm sales possibilities. In the talk at Kansas City there appeared to be a lack of figures on which to base estimates of the present and future use of trucks. The generally expressed view was that the farmer strongly favored a truck of less than two tons and the tractor manufacturers apparently are going in for these sizes. It was generally predicted that trucks made by tractor manufacturers would be a part of next year's tractor show.

In this connection the following information just released by the United States Department of Agriculture is of especial interest. It probably is the first attempt at a census of trucks on the farm. Its approach to correctness is explained in the statement:

"At least 50,000 farmers in the United States own motor trucks which they use on their farms. This is shown by a

preliminary survey of the ownership and use of motor trucks by farmers undertaken by the Office of Farm Management and the Bureau of Crop Estimates of the United States Department of Agriculture. The data secured by this inquiry answer many questions which have been asked repeatedly in recent years regarding the extent to which motor vehicles are used for farm hauling.

"The figures on which totals for the nation and the several States are based were secured from approximately 35,000 selected crop reporters of the Bureau of Crop Estimates. These co-operators were asked to report the names and addresses of farmers they knew who own motor trucks for farm use. Pleasure cars and trailers for use with pleasure cars were excluded, and the reporters were asked not to take account of trucks which are used primarily for general custom hauling, or on regularly established routes.

"This survey can scarcely be considered a complete census, for it is probable that in some localities the crop reporters were not acquainted with all the truck owners, but it is certain that a very large per cent have been listed. It is believed that in no State were less than 75 per cent of

the trucks reported. If not complete in every respect the figures show the relative distribution very satisfactorily.

"The exact number of motor trucks reported is 49,195, divided among the States as follows: Alabama, 847; Arizona, 95; Arkansas, 721; California, 1019; Colorado, 804; Connecticut, 357; Delaware, 100; Florida, 380; Georgia, 1808; Idaho, 329; Illinois, 2261; Indiana, 1548; Iowa, 2773; Kansas, 1732; Kentucky, 818; Louisiana, 310; Maine, 435; Maryland, 596; Massachusetts, 661; Michigan, 1636; Minnesota, 1255; Mississippi, 957; Missouri, 2065; Montana, 359; Nebraska, 2739; Nevada, 41; New Hampshire, 283; New Jersey, 862; New Mexico, 104; New York, 3171; North Carolina, 1450; North Dakota, 501; Ohio, 2261; Oklahoma, 723; Oregon, 369; Pennsylvania, 2760; Rhode Island, 152; South Carolina, 1190; South Dakota, 1708; Tennessee, 978; Texas, 1668; Utah, 173; Vermont, 282; Virginia, 1128; Washington, 682; West Virginia, 465; Wisconsin, 1465; Wyoming, 174."



The above photograph illustrates a development taking place throughout the Middle West. It shows a Kansas garage for automotive equipment. The tractor now has a companion, the truck, the tile house being erected with two compartments

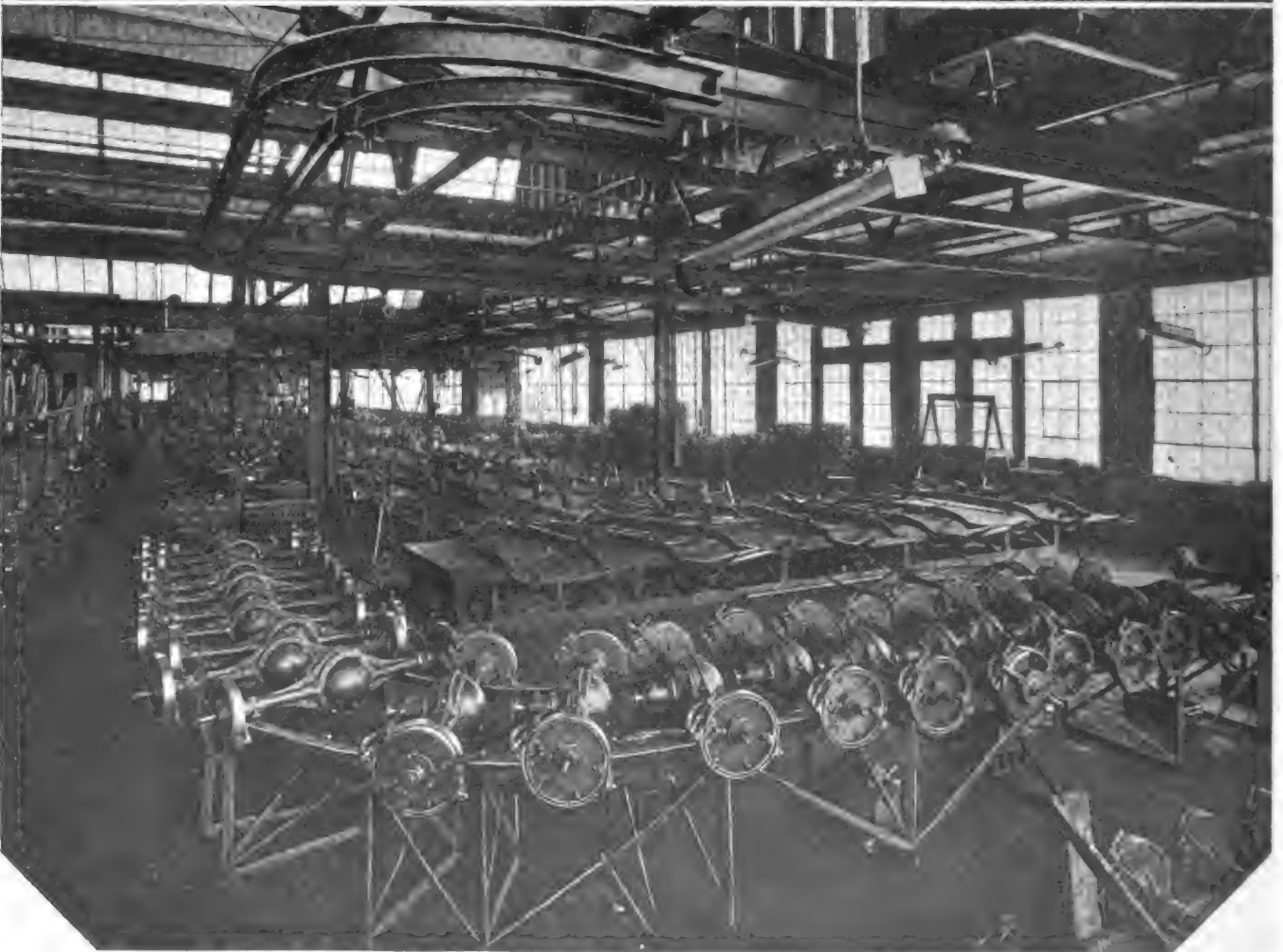


Fig. 1—Start of Essex production line showing finished stock storage space beneath elevated platform on left.
Fig. 2—Axles approaching beginning of chassis assembly line on gravity conveyor.

Speed in Production and Economy in Space Possible in Assembly Line

The efficiency of this last series of operations in car building depends upon many factors, some of which have been eliminated in the plant described here. The general layout is applicable, of course, to many other factories and the article should be read with the idea in mind of speedier production.

By J. Edward Schipper

UNDER the present difficult conditions as regards plant expansion, space economy becomes a prime consideration. In laying out the new assembly plant for Essex cars, this has been given consideration, with the result that a considerable saving has been effected and an advantageous assembly line was obtained. Space generally is lost on account of the necessity for having the finished stock storage along the assembly line at points adjacent to that at which the assembled part is mounted on the chassis or body. This finished stock storage space naturally takes up considerable room, so that an assembly floor is not completely available for production.

The difficulty has been largely solved in the Essex plant by running certain parts of the assembly on a platform and using the space beneath this platform for raw stock storage. The plant itself, taken as a whole, is exceptionally efficient. There are three chassis assembly lines and two body assembly lines. The total capacity is 250 cars in an eight-hour day. The productive force numbers 353 men, giving a total of 2824 man-hours daily on assembly work. Taking into consideration the productive force alone, this gives 11.3 man-hours per car assembled, including both chassis and body assembly.

On the chassis assembly alone there are about 120 men on all three lines, giving a total, on an 8-hour basis, of 960 man-hours for the 250 chassis. This gives an average of 3.8 man-hours per chassis assembled and indicates a high standard of efficiency, due largely to the complete mechanical movement of all the parts. From the time it starts along the line there are no manual transfer movements necessary for the chassis.

The building in which these operations are carried on is a single story, saw-tooth type, 340 ft. wide by 400 ft. long, providing 132,000 sq. ft. of floor area. There is a corner, 40 x 100, taken out of this building. Of this total, 21,000 sq. ft. are on an upper tier, which is used for certain phases of the assembly work. The space beneath this platform is utilized for storage of finished parts at points properly placed along the assembly line. Thus, without a material increase in building expense and with all of the advantages of a single story, saw-tooth construction as far as light is concerned, this arrangement of Essex assembly still permits of the use of almost the total projected area for assembly, and also allows convenient storage for finished parts.

The building is up-to-date as regards lighting. The side walls are almost a solid expanse of windows, and the room has a double, saw-tooth roof, allowing light to fall directly upon the assembly line. The roof construction is such that a great area can be thrown open to per-

mit efficient ventilation of the entire floor space. In this building are housed the assembly chains, paint ovens, final tuning-up testing drums and the export and domestic shipping facilities.

In connection with the export shipping room, it is interesting to note that the construction of the crates has been placed on a progressive basis employing the same principles as progressive assembly in the automobile plant. The use of portable trucks for handling frames and chassis has been rendered unnecessary by the completeness of the assembly chain system. There are two cross-overs necessary along the line, these having been taken care of by overhead cranes. The parts which have been elevated are the second chassis paint ovens, the wheel painting department, lockers and some of the offices and wash rooms.

The general layout of the three chassis assembly lines is such that assembly is practically uninterrupted. Each is 194 ft. in length, the lines running parallel. A line consists of three sets of chains, and one of the features of the layout is that the platform, upon which the chassis is carried during the assembly steps, is returned by the chain itself through a tunnel under the floor. It is not necessary to truck the empty frame back to the beginning of the line. This saves a considerable amount of confusion and floor space.

At the ends of the first lines, an overhead crane picks up the chassis and transfers it to the overhead platform containing the paint ovens, and after the chassis emerges from these ovens on the conveyor, the wheels fitted with tires are attached, and that much of the assembly is taken over to the final assembly line. At that point, the body assembly, which enters at right angles to the chassis assembly, has been completed and the two are joined and go on together along the final assembly line until at the end the car is cranked by its own starter and rolls over to the final testing drums. The entire journey from the time the frame is placed on the conveyor until the car is ready for its final test averages $6\frac{1}{2}$ hours.

With this general outline in mind, the progress of the chassis is quite readily understood. Fig. 1 shows the platform upon which are placed the bare frames with the runningboard steps riveted upon them. It is here that the chassis starts on the journey upon which it travels at the rate of 33.5 in. per min. The rear springs and axles are the first important units to be attached and Fig. 2 shows the rear axles entering at a point adjacent to the beginning of the assembly line. The axles are carried on a gravity conveyor, which is kept full to supply the assembly line. At the end of the first assembly line, which can be seen in the background of Fig. 1, the chassis frames

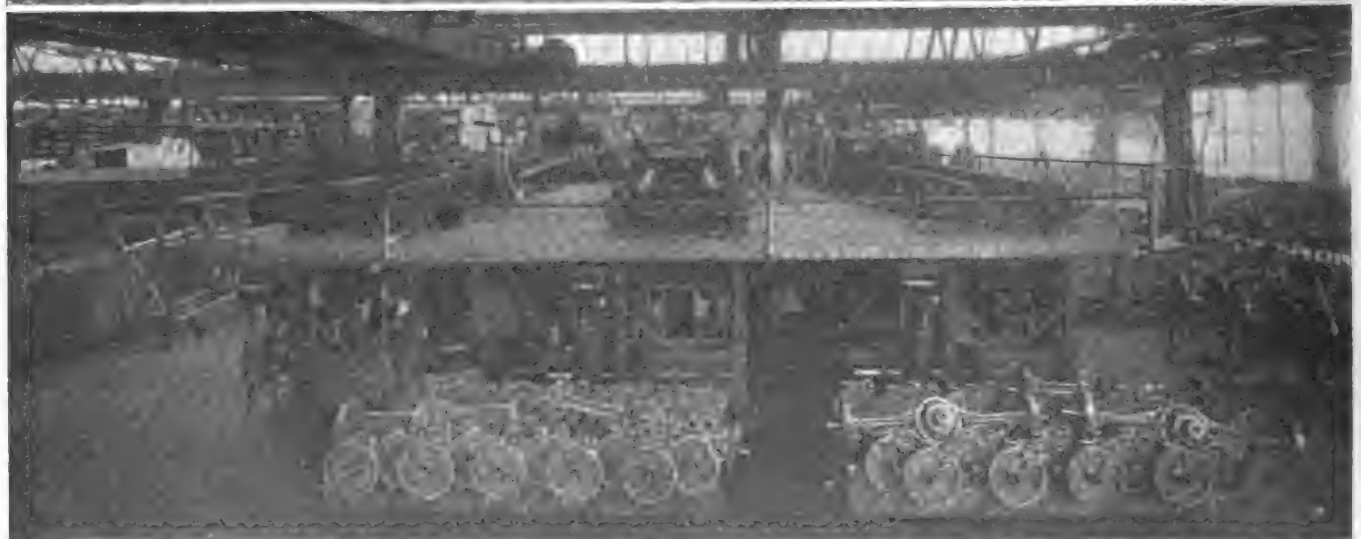
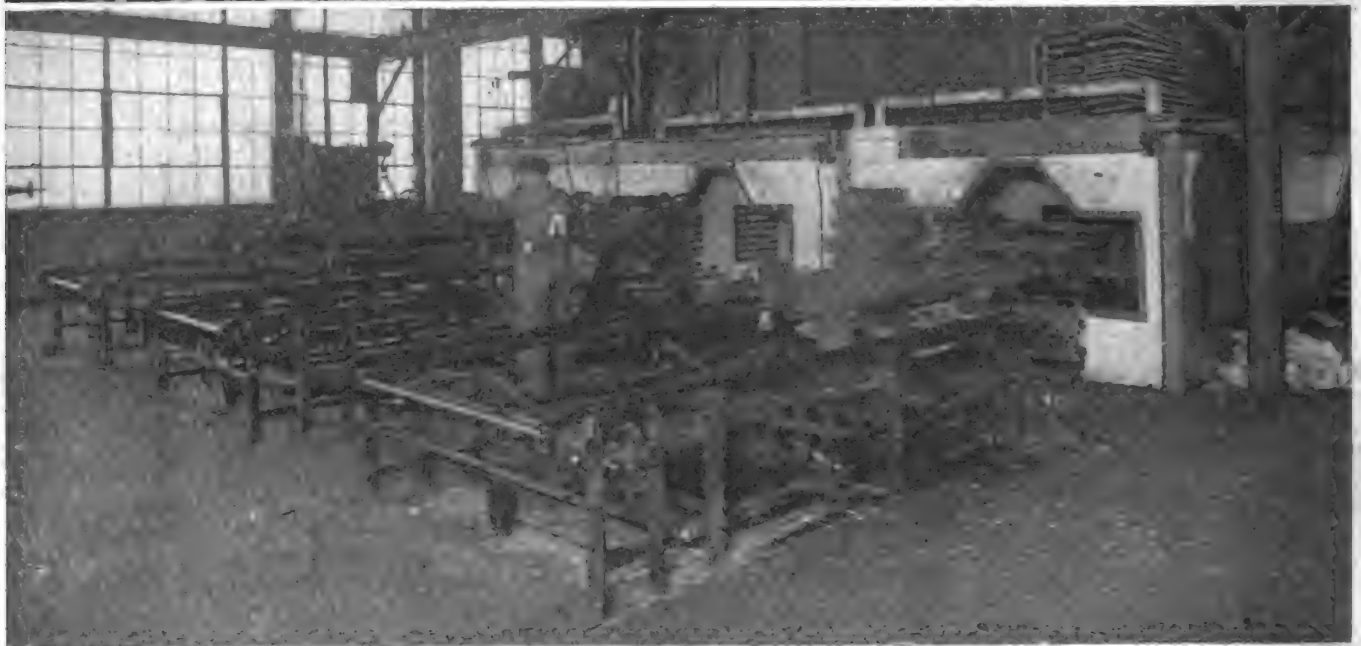


Fig. 3—End of first assembly line, showing chassis emerging from drying oven, where they are lifted by overhead crane to platform and again sprayed.

Fig. 4—Chassis leaving drying oven for transfer to upper platform

Fig. 5—Chassis leaving second drying oven on platform ready to be fitted with wheels

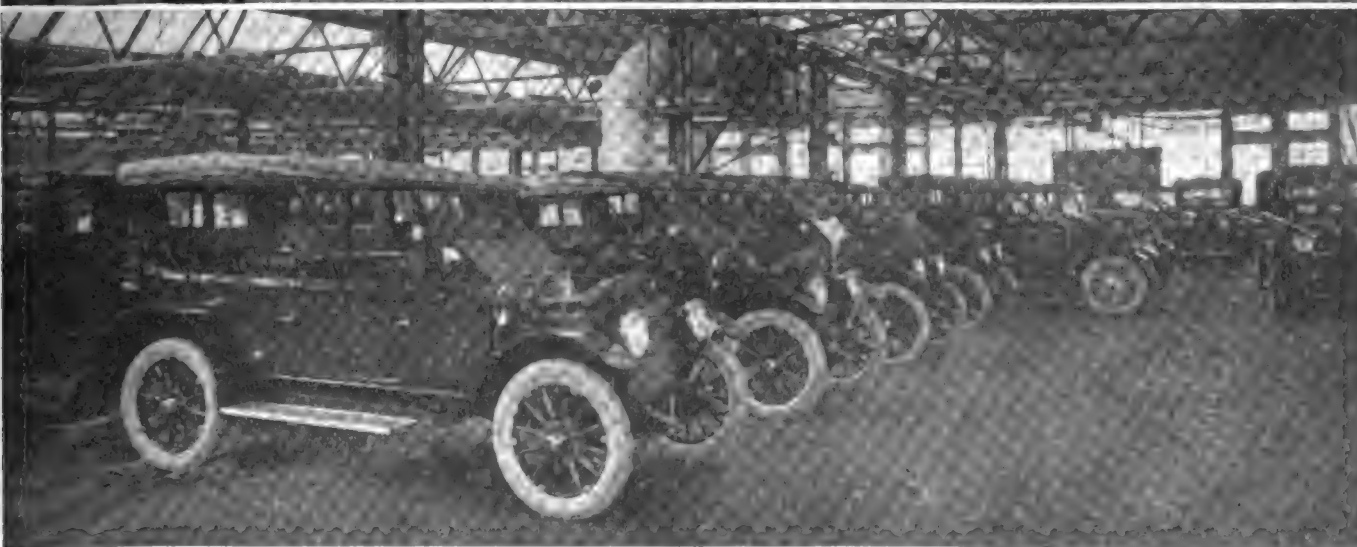
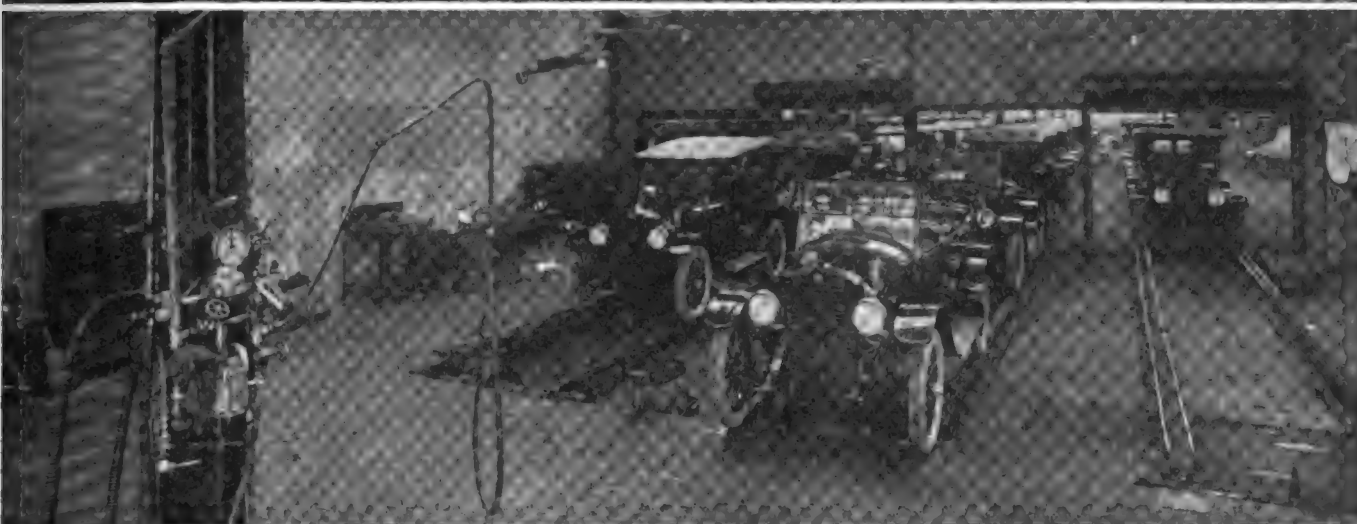
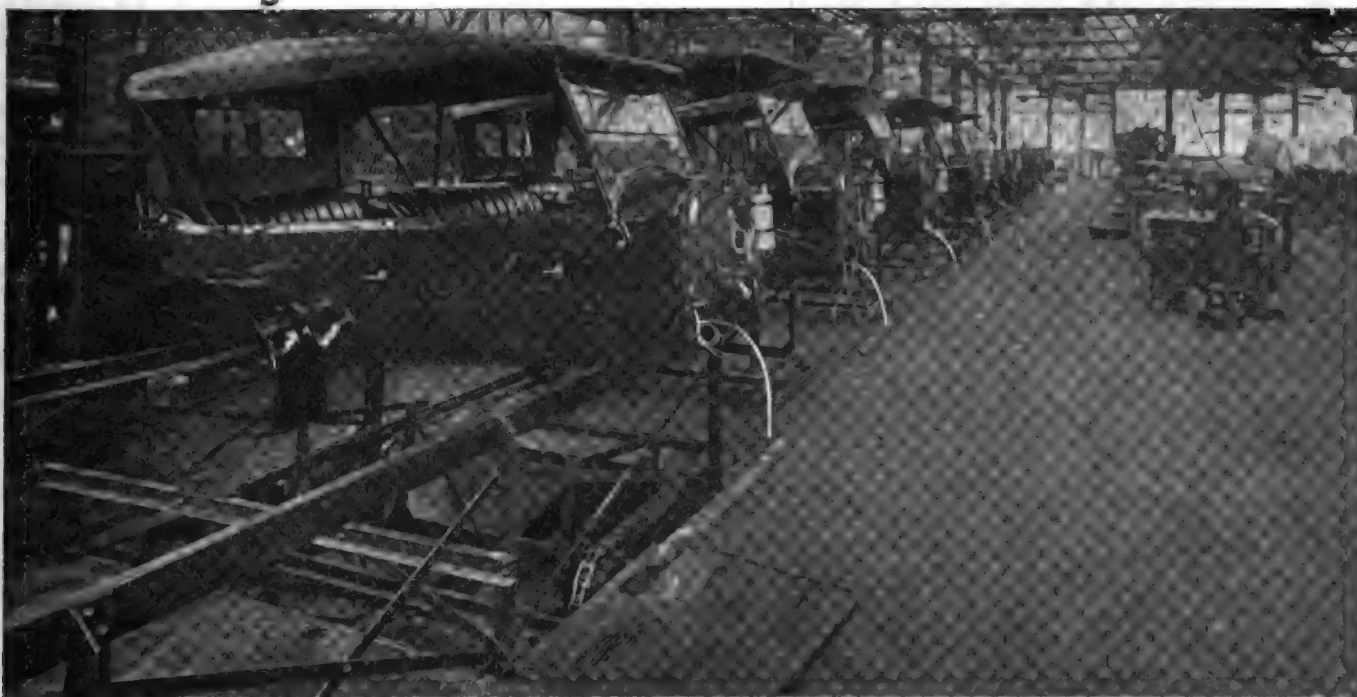


Fig. 6—Completed bodies approaching the final assembly line

Fig. 7—Completed cars leaving the final assembly track

Fig. 8—Cars receiving final tests and tune-up on rear wheel roller testing blocks

enter the first drying oven, having been sprayed at the entrance. They emerge from these ovens at the end of the first line, as shown in Fig. 3. They are then lifted by the cranes shown in that illustration to the raised platform illustrated in the background and again sprayed. The exhaust fans for taking the paint vapor away from the workmen are as shown below the spraying position and, after the spraying is complete, the chassis start through the drying ovens on the platform.

The drying oven on the platform runs practically the entire length of the chassis chain on the elevated section of the floor. As soon as the frames emerge from this second drying oven, they have the wheels attached and they are again picked up by the crane and transferred to the final assembly line.

In the meantime, the body assembly has been taking place along two lines running at right angles to the final assembly line. These body assembly lines are 100 ft. in length and move at a speed of about 28.2 in. per min. Approximately 23 men are employed along each of the body lines. On an 8-hour basis this means about 1.4 man-hours per body assembled. Of course, these figures cover assembly work only and do not include the time on sub-assemblies, or on the manufacture of any unit.

The bodies move along the line illustrated in Fig. 6 until they reach the stage shown in the foreground of this

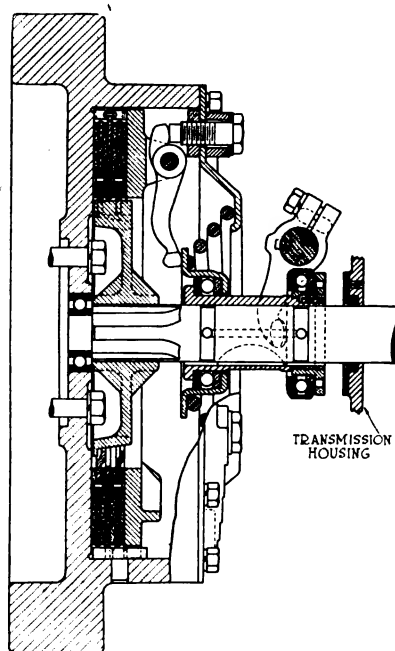
illustration. They are then picked up by an overhead crane and set down upon the completed chassis on the final assembly line. This line carries the cars through to completion, and Fig. 7 shows the finished car coming off the end of the line, where it is started by means of its own electrical equipment and driven to the final test drums illustrated in Fig. 8. On these drums, which are driven by the rear wheels, the car can be operated in the same manner as on a road. The operator can walk around the car, listen to the axles or the engine, and make minor adjustments while it is running. The time consumed in making this final drum test on a car is variable, but averages about 45 min. The speedometer and other units on the dash are in operation in the same manner as if the car were on the road. After the final test and tuning-up, the car is ready for shipment.

The balance of the plant and the efficiency of the layout are illustrated by the relatively small number of non-production or stock men as compared with the production department workers. On the particular day this count was made there were 353 production men and 98 stock men. This gives a total personnel of 451 men assembling 250 cars per 8-hour day. The car weight averages 2700 lb., the phaeton model weighing 2600 lb., the roadster, 2560 lb., and the sedan, 2900 lb. At the present time the ratio is in favor of the open models.

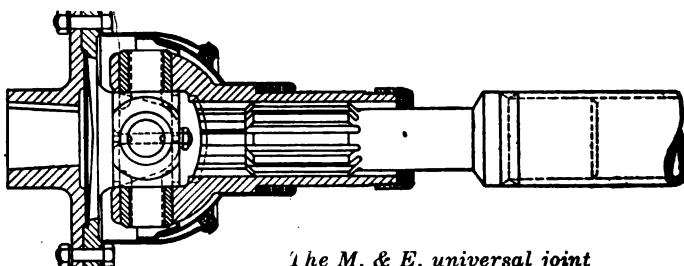
New Merchant & Evans Clutch and Oil-Tight Universal

A DRY disk type of clutch specially designed for installation in unit power plants has been developed by the Merchant & Evans Co. This clutch is made in two sizes, one suitable for engines up to 30 hp. and the other for engines up to 60 hp., the former being 10 in. and the latter 12 in. in diameter. A sectional view of the clutch is shown herewith and it will be seen that it has one driving and two driven metal disks and four asbestos fabric linings so that when the clutch slips friction is developed at four surfaces. The spring pressure is multiplied in a ratio of about 1 to 4 by means of three double-armed levers, the long inner arms of which are acted upon by a volute spring.

The most interesting feature of this clutch is the method of adjustment. There are three set-screws extending through the back cover plate near the circumference, against the inner ends of which the short arms of the clutch levers act. These screws extend through curved slots in an adjusting ring having a stepped surface on its outer face. Adjustment is effected by loosening the three screws, turning the outside ring about one inch clockwise, and then tightening



Sectional view of new
M. & E. disk clutch



The M. & E. universal joint

up the screws. This operation insures uniform adjustment on all three levers and can be accomplished in a few minutes.

The M. & E. universal joint, which was described some time ago, when it was made only in the grease-packed form, now is also made in an oil lubricated form. This latter form has oil-tight washers at the end of the sliding sleeve and in the hub of the pressed steel housing, an anti-dirt hemp packing in the groove of the outer member of pressed steel housing and an oil-tight leather sleeve between the two members of the housing.

We are informed that samples of this oil lubricated joint have been run 30,000 car miles at speeds up to 40 m.p.h. in all kinds of weather, the joints working up to an angle of ± 15 deg., without loss of oil or injury to the packing. The inside leather sleeve is depended upon to retain the oil in the case, the outside packings only serving to keep out dust and grit. The oil is introduced into the housing through a radial hole in the shaft where the tubular portion joins the solid portion, which radial hole runs into an axial hole through the "solid" portion of the shaft.

A Correction

A RECENT article in AUTOMOTIVE INDUSTRIES stated that the front wheel brakes on the Excelsior car, made in Belgium, were of Perrot design. These brakes are special to the Excelsior factory.

Get Yours—It's Guff, but It's Free

Recently there has been printed in *AUTOMOTIVE INDUSTRIES* a series of articles on the poor publicity put out on behalf of automobiles and printed in "automobile sections" of the daily newspapers. These were written by "automobile editors," who placed the blame on manufacturers. Here is the other side of the question, written by the automobile advertising men. This comment was printed in the Editor and Publisher.

By F. A. D. Seelye*

THE high cost of print paper has made it incumbent upon hundreds of newspaper publishers throughout the country to scrutinize closely the way their automobile pages are being edited. In many cases, in fact, space has been cut down to such an extent that it can no longer be called legitimately an automobile page. This condition was not brought about through the publishers' own volition, but because it was made mandatory by the acute shortage of paper.

So this condition brings us face to face with the situation as to whether or not the automobile page should be continued as it has been edited and conducted in the past. There is no getting away from the fact that the more lenient a newspaper is with its white space, so far as it pertains to automobile publicity, influences a selection of a medium to carry a distributor's copy. Especially is it true at this time when most of the automobile manufacturers have adopted the policy of sharing advertising expense equally with the local distributors. In this way the personal equation or a little write-up might secure the account for a paper that was not really entitled to it because a contemporary paper made its impress felt upon the advertising department.

This condition exists especially in all the fairly large sized cities throughout the country. The factory no longer enjoys its former exclusive prerogative of deciding what papers the distributors should use. The factory's advertising activities being controlled by a man who is in the custom of selecting papers according to the quantity and quality of the circulation is not influenced one iota as to whether a paper is susceptible to publicity items.

The space devoted by most newspapers to automobile publicity has been a tremendous factor in their phenomenal success. It has served to set them apart in the public mind from other equally as important commodities, such as the reaper and cotton gin, for instance.

There is no doubt but what constructive automobile publicity carries a real news value for people who are either in the market for a car now or are contemplating the purchase of a machine at some future time. Nevertheless, there is no disputing the fact that there has been a lot of drivel among the material submitted by the factories, while, on the other hand, there has been much that has been constructive and worth while.

In the past most of the stories have been written around the head of the firm and what he thought, and said, and did. One of the reasons that the present automobile pub-

licity is objectionable is because 75 per cent of the copy is about such matters and other sundry items concerning trade tendencies, good roads in Madagascar, etc.

The average newspaper reader is not interested in such stories, but stories about new features of any car, such as 15,000 miles on a set of tires or 30 miles on a gallon of gasoline, is something that every automobile owner or prospective purchaser of a car will read with interest and delight.

Practically every well-known automobile advertising manager in the country is unanimous in the opinion that the present method of conducting an automobile section is unsound.

H. R. Hyman, advertising manager of the Cole Motor Car Co., is very emphatic in his remarks about the character of automobile publicity that is now appearing in most of the automobile sections of the daily press. He says:

"Personally, I feel that as long as newspapers are giving automobile publicity, it is up to each and every one of us to get just as much of it as we possibly can, but, frankly, I believe that its actual worth is greatly overestimated.

"I have come to this conclusion simply from the fact that in quite a long experience in the automobile industry, I have yet to find a publicity story which created any considerable amount of comment, while one hears arguments and discussions continually emanating from what persons have read in automobile ads.

"Frankly, I believe that we will all be a whole lot better off when newspapers no longer take the ordinary gush that is sent out by motor car companies, but will have each company render them sort of a news service in which brief statement of facts concerning the company will be set forth and on which the motor car editor may ask for elaboration from the advertising manager should the subject mentioned attract him as having certain news value."

The Goodyear Tire & Rubber Co. has a well-equipped publicity department. Many newspaper men concede that Goodyear sends out the best constructive publicity of any rubber company. Therefore, the remarks of E. E. Helm of the publicity department are interesting:

"The automobile page, in my opinion, has to a large extent lost what advantages it originally possessed by reason of the abuses that have been allowed to creep in—notably the meaningless 'boost' write-ups. This, of course, is not so in all cases, but there is an inclination on the part of the public, I am afraid, to look upon the average automotive section as a sort of depository for the effusions of the energetic press agent.

*Advertising manager of the Packard Motor Company of Pittsburgh.

"This is unfortunate, of course, but it is a condition brought about largely through the advertising solicitor's anxiety to sell his space and agreeing to use free publicity without regard to its merit. Constructive publicity, so called, if adhered to, might save the situation, as there is no doubt plenty of demand for intelligent, technical, or helpful information for the automobile user as well as publicity taking the form of straight news stories with a minimum of propaganda.

"We try to make our publicity of that sort, but in placing our advertising do not pay any attention to whether or not our publicity is used. We do, however, in placing our advertising contracts provide that our copy be used on pages other than in the automobile section."

The Place of Advertising

Of recent years several automobile firms have been sending out contracts with the stipulation that their advertising is not to appear in the automobile section. Franklin, Packard, Pierce-Arrow and other manufacturers prefer to remain out of the fold. All the large rubber companies do likewise, namely, Goodyear, Firestone, United States, and Goodrich.

H. H. Goodheart, advertising manager of the Franklin Automobile Co., implies the reason for some advertisers wishing to remain out of the automobile section. He says:

"I have always felt that an automobile page could be made interesting. The same thing that makes a sporting page interesting could just as well apply in the case of motor cars, which have almost as big a following as baseball, boxing, football, etc. Probably nothing in the line of recreation is more in the minds of people than the automobile.

"I have felt all the time that 'puffery' in an automobile page is a mistake. Also, that the subsidizing of the automobile page through automobile advertising is one of the reasons for all the ills that automobile publicity is contending with. Automobile news ought to stand on its own legs.

"As the majority of pages are now edited, they do not appeal to us. In fact, we would much prefer that Franklin advertising be separated from the automobile section. Somehow, we don't like the atmosphere of the majority of the sections. There is so much stuff that is purely of the press agent variety in them that it prejudices well-intended advertising. We want what we say about the Franklin car to be believed, and we don't want any more resistance to this aim than we absolutely are compelled to have. I think, considered in the mass, the automobile page has done a great deal for the automobile industry. It is hard for me to see the advantage of hundreds of such pages when considered separately."

The condition that Mr. Goodheart mentions is due, no doubt, to the fact that most newspapers have never drawn a line straight and plain between legitimate publicity and mere advertising in the guise of news.

No Disguise for Advertising

Advertising is all right, but should wear no disguise, and it should be purchased and paid for at regular space rates, with no bonus in the shape of write-ups in the news columns. The test of legitimate publicity matter must be absolutely its news value, and if an automobile company has no matter to give out that will stand that test, independent of any advertising, it has no occasion for a publicity department.

Mr. Walsh, publicity manager of the King Motor Car Co., observes:

"My ideas on automobile publicity are conflicting, sometimes I convince myself that the usual run of publicity

isn't worth a 'tinker's hoorah'; then on occasions I hear a few people comment on it, and I change my coat and convince myself that there may be some merit in the stuff because some papers continue to run publicity; we try to get our share of it.

"I believe the majority of men connected with the industry of supplying automobile publicity will endeavor to improve and get real news in the stuff they send out, and further I think that the future of the automobile page will be a matter of evolution, as worked out by the paper's advertising department and the publicity men furnishing material."

L. B. Dudley of the Federal Motor Truck Company predicted at the Advertising Managers' meeting at the National Automobile Chamber of Commerce in New York around the first of the year that it was only a question of time when the newspapers would discontinue using automobile publicity where the name of the product was mentioned.

It is hard to conceive, however, of such a bold step being taken by a few newspapers. In cooperation there is strength, and unless the papers work in unison the paper that instituted such a movement would soon find that its automobile lineage was dropping faster than the Hindenburg line broke before the onrush of the allied troops.

Mr. Dudley, who entertains some vigorous ideas on the way a newspaper should edit its automobile section, says, among other things:

"The proper use of publicity in question is it tells the news story of automobiles and motor trucks, which is the only thing that will prevent eventually the entire publicity matter being cut out of all newspapers, and I think it is up to each and every advertising manager to get the broad viewpoint and tell those stories which will build up the industry and which are of news to the greatest number of readers of the publication, and leave out all of this small-town stuff and small-man opinions and space fillers.

Cut Publicity to News Value

"As far as the Federal is concerned, we would be perfectly happy if all publicity was cut down to the real meat of the news value of the story and the name left out of all of them. If this was done we would take our chances on getting our share of the results, but until that time comes, of course, we are going to use publicity."

R. C. Sackett, in charge of automobile advertising for the Studebaker Corp. of America, holds opinions directly contrary to the above.

It is well to remark, however, that Mr. Sackett is practically alone in his optimistic forecast of the trend of the average automobile page. He says:

"I believe that the growth of the automobile page idea is assured. Any restrictions that are now being placed upon the automobile page or automobile section, I believe are only temporary and are contingent upon the supply of white paper. The shortage of white paper surely will be relieved at some time, as it is inconceivable that it will go on this way forever.

"Furthermore, during the past two years there has not been as much automobile advertising in the newspapers as there would have been had there been a normal growth and had we not been interrupted by the war. The war cut down the amount of newspaper automobile advertising in 1918, and the unusual shortage of cars, which has not yet been overcome, cut down the advertising in 1919, and the amount of newspaper advertising ought to begin to grow during 1920, and as it does increase there is every reason to believe that publishers will devote more space and more time and attention to constructive automobile pages.

"As far as publicity goes, I do not believe that publicity which has no news value is worth anything. The majority of canned publicity articles that are sent out by the manufacturers are pure bunk."

A constructive thought contributed by Mr. Sackett is that more local copy should be used. Make the publicity personal. Eliminate John Jones said this and that, and publish something that the average automobile owner will be interested in reading.

J. E. Baird, advertising manager of the General Motors Truck Co., declares:

"I would welcome the day when the newspapers would cut out the slush they now use in their automobile sections of the Sunday papers.

"I believe that the newspapers ought, and should be, willing to use constructive publicity; that is, articles that are of a news value as news, or that are instructive and helpful to users of automobiles and trucks."

Another automobile company that spends a quarter of a million yearly in newspaper advertising, but whose advertising manager prefers to remain anonymous, says:

"I do not believe that automobile publicity, as handled at the present time, in ninety-nine newspapers out of a hundred, has the slightest influence one way or the other on the pleasure or satisfaction of the readers of those newspapers.

"If I am right and automobile publicity as at present conducted is a matter of indifference to newspaper readers, then I think the conclusion can safely be drawn that most automobile publicity is a waste of white paper as far as the newspapers are concerned, and a waste of effort as far as the automobile manufacturers and dealers are concerned.

Automobile Page Unbiased

"I believe that the automobile page in the future will and should be a page of unbiased, thoughtful and exact review and criticism, conducted without fear or favor by a man who has been carefully trained for his job, and who is, as far as possible, outside the control of his newspaper's business and advertising departments."

H. C. Dart, advertising manager of Paige-Detroit Motor Car Co., said:

"I would welcome concerted action on the part of the newspapers to compel a rigid censorship of publicity, and I certainly wish the instigators of this movement the best of luck.

"It is my observation that the best newspapers in the country either refuse to publish any publicity at all, or print only the kind of stuff which is real news. I refer to such publications as the *Kansas City Star* and the *Chicago Daily News*, but there are many others.

"This company does not discriminate against any newspaper that either excludes publicity entirely or restricts it very closely so long as the same restrictions pertain to all advertisers. Personally, I have a higher opinion of such papers."

Fred Wellman, advertising manager of the National Motor Car & Vehicle Corp., sums up in a concise way the best manner in which an impartial automobile page should be conducted. He says:

"Our idea of a good automobile page would be one that features mostly the new and interesting developments in current models, together with seasonal information as to local tours, answers to questions from owners regarding care and upkeep of cars and similar information of direct interest to the motorist. We believe that a page edited in the above fashion would be read with keen interest by a majority of automobile owners, and that advertising on such a page would undoubtedly have extra value.

"The reform of automobile pages of the present day,

we believe, will have to come about through the efforts of the editor rather than the advertiser. The advertiser will usually submit anything he can get away with, relying on his purchases of display space to put his copy over. As long as the newspapers accept material on such a basis, obviously there is going to be little improvement.

"If the newspapers, however, will edit their automobile pages as the editors of automobile trade papers do, for instance, giving space only to real automobile news and rejecting everything else, the reform that every manufacturer would welcome will be accomplished."

A Constructive Force

Much along the same lines is the opinion of Ralph Kaye, advertising and publicity manager of the Kissel Motor Car Co., who says that he believes that the right kind of newspaper publicity is of great constructive force. To make it worthy of note this publicity must contain real news of interest to present and prospective owners—it must not be a free advertising puff.

Practically every manufacturer of a medium-priced or better-priced car in their price field is interested in reading the automobile pages if it is conducted along the proper lines.

As A. J. Rogers, advertising manager of the Nordyke & Marmon Co., says:

"We do believe that automobile owners and persons interested in the purchase of cars like to read the automobile news, but they want something that either has some real news value or real feature value rather than a lot of the bunk that is being passed out."

It was significant that a meeting of the Automobile Advertising Managers was called at the time of the New York Show in an effort to thresh out this matter of free publicity. A good many of these discussions were productive of constructive ideas. In fact, the whole meeting was dominated by the talk on newspaper publicity. Some extreme views were expressed and one advertising manager went so far as to offer a resolution condemning publicity without reservation. It is well to note in passing that he was supported by two others.

As Harry S. Daniels, advertising manager of the Dort Motor Car Co., said following the meeting:

"No one would suggest amputation of the head to cure a cold, and publicity can certainly be made valuable to the industry if properly planned and executed. The real remedy lies with the newspapers themselves. Instead of running their automobile pages with one man, who is usually also the advertising solicitor, they should assign to automobiles able writers and editors who will make of the page a news feature which its importance justifies. By following up local owners of automobiles, a world of live interest matter can be obtained—matter which will interest the reading public generally. The opportunity for pictures of a newsy character is just as great."

Condemns Bunk

It does not take any stretch of the imagination to see that fully 95 per cent of all the automobile advertising managers in the country have gone on record as condemning the kind of publicity that is being used by the newspapers. In fact, most of them go on record as calling it worthless, and some even refer to it as "bunk."

Inasmuch as the factories themselves are not in favor of their own publicity, it would seem as though the doctoring should be taken care of by the different newspapers. In fact, it would seem that if all the newspapers would get together and adopt rules and regulations in an effort to standardize the kind of publicity they would accept and publish, it would go a great ways toward obviating the present discontent that seems to hold sway in this field.

What the Industrial Report Means to the American Manufacturer

Believing that few business men will have the time to read carefully the lengthy report of the Second Industrial Conference, Mr. Tipper gives here its best points and interprets it for the benefit of the employer. He explains briefly the proposed machinery for settling disputes, and stresses several other forward-looking parts of the report.

By Harry Tipper

THE Second Industrial Conference called by the President has just returned its report. It is to be remembered that the first conference split over the question of collective bargaining and the recognition of the union program. From the beginning it was evident that the first conference could not arrive at any proper conclusion because of its composition. The second conference was made up of individuals chosen because of their standing in public life, their knowledge of economics or their contact with industrial affairs. These individuals were not bound by the mandates of any associations and were in a position, therefore, to occupy themselves with impartial proposals looking to the solution of some of the questions at issue.

It is not likely that the report will have any material bearing upon governmental action. Most of the report is concerned with conclusions arrived at by the conference after its investigation into their particular subjects. The conclusions are offered for the information of industry and the public and no suggestions are made for machinery to take care of the suggested difficulties. There is one important exception to this and it is, in fact, the most important part of the document. Machinery is suggested of a national and regional character, worked out with considerable care, for the settlement of industrial disputes through voluntary action by the parties concerned. It is this part of the report which may receive the attention of Government and Congress and which concerns the manufacturer more than any other particular point, although much could be learned from a study of the other conclusions.

The foundation principle which has guided the conference in its examination of methods for the settlement of industrial disputes is to be found in the two paragraphs quoted here:

The guiding thought of the conference has been that the right relationship between employer and employee can be best promoted by the deliberate organization of that relationship. That organization should begin within the plant itself. Its object should be to organize unity of interest and thus to diminish the area of conflict and supply, by organized co-operation between employers and employees, the advantages of that human relationship that existed between them when industries were smaller. Such organization should provide for the joint ac-

tion of managers and employees in dealing with their common interests. It should emphasize the responsibility of managers to know men at least as intimately as they know materials, and the right and duty of employees to have a knowledge of the industry, its processes and policies. Employees need to understand their relation to the joint endeavor so that they may once more have a creative interest in their work. Industrial problems vary not only with each industry, but in each establishment. Therefore, the strategic place to begin battle with misunderstanding is within the industrial plant itself. Primarily, the settlement must come from the bottom, not from the top.

It is encouraging to find that a conference of this character has recognized the necessity of unifying the organization within each industrial establishment. The position which has been taken by the writer in these articles has been indicated a number of times and the continued emphasis which has been placed in these articles on the necessity for starting the settlement of industrial relations in the individual establishment is again emphasized by the paragraphs just quoted.

It is evident that the conference feels strongly upon this subject. It regards the joint organization of the individual establishment through employee representative plans as a preventive measure and, therefore, of more importance than any measure which may be taken for the settlement of disputes once they have arisen. The fact that the employee representative plans have aroused opposition from both the more reactionary employers and the more important trade union leaders, is much in its favor and an indication of its value.

It is interesting to note that Mr. Gompers, in his comment upon the report, disagrees entirely with this part and, in addition, expresses considerable contempt for the new machinery proposed.

The machinery proposed for the adjustment of disputes which have already arisen, takes in a National Industrial Board, with Regional Adjustment Conferences which shall be empowered to deal with industrial disputes when such differences are submitted to them voluntarily by both parties. The submission of the dispute to the Regional Conference, however, constitutes a voluntary agreement between the parties that there shall be no cessation of production during the process of adjustment and that unanimous agreement of the Regional

Conference, or the other machinery provided for the purpose, shall constitute an effective collective bargain, which the parties agree to accept.

It is not necessary to go through all the detail of procedure but it is important to examine the composition of the board and the provisions for the publicity of the findings. The National Industrial Board, proposed under this plan, is to be composed of nine members: Three representing employers, three representing employees and three representing general interests. It is stated that they shall be selected without regard to political affiliations and that the chairman shall be chosen by the President from one of three persons who represent the general public. The term of office is to be six years. The function of the National Adjustment Board is to act as a Board of Appeal in disputes not settled by the Regional Conference and to lay out the general administrative plans.

The Regional Conference calls for a chairman representative of the public interest appointed for three years and vice-chairmen as required for specific cases. It also provides for panels of employers and employees from whom will be drawn the members to sit upon the Regional Board for any particular case. The position upon the panels is to be determined by lot, with the selection from the panels to be in rotation. The conference, as actually constituted, will consist of four representatives of the parties to the dispute, four persons selected from the panels and the chairman. Disputes must be voluntarily submitted to this conference and they cannot be acted upon by the chairman until he is convinced that proper attempts have been made to settle the matter through the ordinary machinery.

There is a provision for the constitution of a Board of Inquiry from the Regional Conference, where the parties refuse to submit the matter. This Board of Inquiry has power to ascertain the facts and give them to the public. There is a provision for the application of the machinery of this type to public employees, suitably modified to agree with governmental employment.

The rest of the committee report is concerned with industrial relations as a whole, hours of labor, women in industry, child-labor, housing, wages, profit and gain sharing, cost of living, agriculture and unemployment. A part of the report is devoted to the necessity for a public employment clearing house.

The report is characterized all through with a degree of impartiality not found in previous reports of this kind. The statements under hours of labor indicate this constructive approach to the problem. Here again the Industrial Conference has recognized the fact that proper hours vary with the character of the employment and that, until further scientific knowledge of the effect of various kinds of work will indicate the basis upon which this question should be considered from a public standpoint, only a relative improvement can be made. The conference goes on record definitely for one day's rest in seven, for not less than forty-eight hours, as a general matter, and recognizes the present tendency of practice for a schedule of not more than forty-eight hours.

The discussion of child-labor is timely, inasmuch as the United States has not been able to deal with that matter and the regulations of the States vary to a considerable degree. In its public efforts to safeguard the health, to consider the education and to increase the standard of its working children, the United States is far behind European countries. In some States, the conditions are notoriously bad and it is to the employers'

interest as well as to the public interest to have the matter of child labor thoroughly studied and put upon some sound basis.

The position of the conference on the wage question is summed up in the two paragraphs quoted herewith:

If it is for the nation to insure that wages shall not sink below a living level and for employees not to restrict production; it is incumbent upon employers to see that special effort and special ability on the part of their employees receive a stimulating compensation. If increased output and efficiency are met only by a reduction of piece prices, the incentive to such effort is taken away. Employees to do their best work must feel that they are getting a reasonable share of any increased return that they bring the industry. Labor incentive is a factor that is as shortsighted to ignore as incentive to capital.

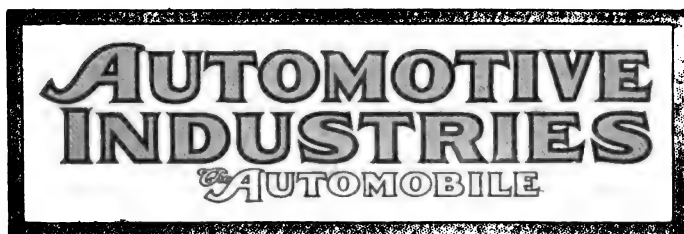
From this standpoint, the question of methods of wage payment is one that deserves careful study on both sides. Industries which have established facilities for mutual discussion of such questions, whether through union or other forms of employee representation, are finding that it is possible at the same time to safeguard the worker from exploitation and to safeguard incentive to production.

The other part of the report deserving study and particular mention is that dealing with public employees. This conference has paid due attention to the failure of municipal, state and national governments to provide reasonable means for the payment of government employees in some relation to the increasing cost of living. It specifically takes up the question of teachers and points out that since the principle of governmental employment removes the possibility of any resort to the strike, this only emphasizes the importance of providing means whereby these public employees will be treated justly.

The position of the conference on this matter is one which has been neglected far too long and manufacturers in all industries should be much interested in government machinery for the constant adjustment of wages of public employees. There is no hope of our securing reasonably efficient postal service, patent office service, the right kind of co-operation from the Department of Agriculture, the Bureau of Standards, the Department of Commerce and other bodies relating largely to industrial matters, unless the payment of government employees is upon a just basis and recognizes economic conditions with a reasonable certainty. It is particularly hazardous to leave such a disparity in the payment of policemen, firemen and others organized for the purpose of protecting the ordinary citizen.

Industry would do well to interest itself thoroughly in the question of payment of government employees, and particularly those departments having a direct bearing upon the safety, the health, the protection and the development of industrial efficiency.

Altogether the report is encouraging, it does not suit Mr. Gompers, but it has had the effect of showing how completely Mr. Gompers desires the dominating influence of trade unionism in the government of industrial matters. It will not suit the reactionary employers of the old school but it will appeal to the average man, both employer and employee as a sane constructive document, which will, if it is properly studied, illuminate many of the industrial questions at issue and provide some basis for the common understanding of their significance.



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Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907, and The Horseless Age (semi-monthly) May, 1918.

An Automotive Safety Plan

IT is a part of the year's program of the National Safety Council to reduce the number of deaths from automobile accidents. That was announced in a recent issue of the *National Safety News*. This idea, briefly, is to draft an educative plan in driving and traffic control. It is to be submitted to a committee of eminent and practical manufacturers and safety engineers representing many industries. Then it is to be revealed to the public through schools and public gatherings.

The big fact on which the plan is based is that 9000 persons were killed in this country last year by automotive vehicles. The figures are given as a fact and they do not appear to be unreasonable when the results in some cities are set forth. It is said that automotive vehicle accidents equal all other industrial accidents. There has appeared in certain circles some resentment of this activity and of the publicity given to these figures.

But why? The automotive industry is vitally interested in these things. These very fatalities are an ailment which must be cured, if the automotive

vehicles are to enjoy the reputation they should have. Of course, it is unpleasant, as is the case of the man who goes to a doctor and is told that his heart action is weak and that he must undergo certain treatment if he is to live. If he is a sensible man, he takes the prescribed treatment or submits to an operation, and thereafter enjoys better health.

So now, if the safety operation seems advisable, let's help it along. The results soon will be apparent if the treatment is correct, but the automotive industry should step in and help to formulate the treatment. Once the operation is over, these things will result:

Much of the dogmatic opposition to automotive vehicles in legislative circles will disappear.

Sales resistance among timid persons, who fear taking the life of another more than the danger to themselves, will lessen.

Traffic conditions in the larger centers will be eased and persons who now scorn to own a car can be induced to buy.

The reckless driver who is creating a sentiment against automotive vehicles will be curbed.

The automotive industry has grown rapidly and well, but to too great an extent its eyes have been centered on the problems of the moment. Design has been refined and great progress made mechanically. But in older lines of trade certain educative work has been undertaken with great success by the industry, and it is time that our automotive manufacturers look toward refinement in the use of their vehicles.

The Farm Truck

IT is becoming evident that a large proportion of the demand for motor trucks in the next few years will come from farmers. Each year an increasing number of farmers are investing in tractors and, as a result, are enabled to dispose of some of their horses; however, they will be able to realize the full advantage of their tractors only when they are in position to accomplish by motor power all of the various kinds of work for which horses generally are used on the farm. A large part of this work consists in hauling, hence the motor truck meets an important requirement of the farmer.

Until a few years ago motor trucks were sold almost exclusively in the large cities and truck design was strongly affected by this condition. As a result of the opening up of the farm market, we will probably see an entirely new type of truck design developed, taking account of the peculiar conditions of use. The farm truck must be able to travel over fields as well as on roads, for it will be used in gathering the products of the farm as well as for carrying them to market and taking back merchandise that the farmer buys.

One of the problems connected with farm truck design is due to the widely different character of the loads it must carry. The farm truck will be used for hauling hay as well as for hauling brick and stone; it must serve for transporting live stock and

it must carry grain in bags. This problem of dealing effectively with widely different kinds of loads is probably best solved by the provision of interchangeable and convertible bodies, and the solution has been foreshadowed in present farm wagon practice with its side boards, tail gates, hay racks, etc.

It is generally believed that the proper size of truck for the great majority of farms is one of 1½ or 2 tons load capacity. A large truck would have to be operated at less than half load too large a proportion of the time, and would be uneconomical in operation, aside from the larger capital requirement. A smaller truck than 1½ tons could not handle all of the loads that must be taken care of. Very likely the farm truck will be pneumatic-tired because large pneumatic tires will enable it to travel over soft ground where wheels with solid tires would sink to a great depth and the higher speed of the pneumatic truck will be an appreciable advantage in carrying produce to distant markets. The somewhat higher first cost of pneumatic equipment is a drawback, which, however, is not serious if there is plenty of work so that the truck investment is not idle a large part of the time.

The problem of keeping the truck working can be solved by adapting it for as many purposes as possible. The provision of a power take-off would permit use of the truck for belt work, and a power hoist would add greatly to its utility for certain classes of work.

Every farm tractor that is being sold creates a demand for at least one farm truck, and, since it is calculated that about 300,000 tractors will be sold this year, it will be seen that the possible farm truck market is a large one. Even where there is no tractor on the farm, the truck has its advantages in relieving the demands made on the horses, and these are particularly pronounced if the district has plenty of hard surfaced roads.

Spirit and Production

WHAT has that intangible thing called "the spirit of the plant" to do with effective production? That there is such a thing and that it is present, just as definitely as if it could be seen and measured, is not to be doubted. It is almost always true, moreover, that the spirit of the management, as embodied in the ideas and opinions of the chief executives, "carries on to some degree" through the foremen and minor executives and permeates the work of the entire plant.

The general spirit of the automotive industry, particularly as related to the feelings of the management toward their workmen, can probably be classified in a general way in two divisions. First, those executives who feel that their experience indicates that their men are ready to take advantage of them at every turn, that the worker's chief object in life is to get as much money for as little work as possible, that industrial relations are similar to a perpetual battle and that the only solution, so far as

they are concerned, is to "get labor where they want it." The second group, which comprises some of the best known and most successful firms in the automotive industry—as also does the first group—is comprised of those firms whose executives find that the square deal policy works out to the profit and benefit of both themselves and their men.

One chief executive of a comparatively small plant said recently, "The only way you can handle the labor problem is with the big stick; these men do not appreciate anything you do for them. Anyone who tries to tell you they can be dealt with otherwise is impractical; he has had nothing to do with the actual operation of an industrial concern."

While this firm has not had any actual strikes, some of its departments are constantly visited by that industrial specter, the Enormous Turnover, and there is a constant attempt on the part of both management and men to get the better of one another in every way possible. It is not merely the theorist who will say that such a condition is utterly subversive to maximum production.

This fact is witnessed by what the vice-president and production manager of a prominent large concern said: "We have never had any labor trouble, and we usually have the lowest turnover of any automobile manufacturer in our city. It is hard to state a definite reason for this. We simply treat all our men as we would like to be treated ourselves. We try to instill that spirit into every man in our organization from the top to the bottom." And the employment manager of the same concern firmly believes that this intangible "spirit," practically manifested in many ways, is a definite aid to production and to turnover reduction.

These two examples are illustrative of two different, yet typical, attitudes toward labor current in the automotive industry. As a general thing, the firms whose policy follows the lines of the second example are getting better and more constant production and are much less troubled with absenteeism, lateness and general inefficiency. It is these things which concern the practical production man. It is important to note, however, that this "spirit" of co-operation has not been, and cannot be, built up overnight. It is a long process, which must start with a belief in the efficacy of the square deal. The spirit of the plant can never be changed overnight by the installation of some "welfare plan" or even by a change of heart on the part of the management.

A RECENT trade announcement is to the effect that the fourth American Chamber of Commerce in China has been established at Harbin. Recent months have seen the promulgation of many such bodies throughout the world, and these, in connection with the activities of official and other semi-official agencies, evidence the growing place of America in world trade. And, by the way, it might be added that such organizations as that at Harbin stand ready to aid automotive exporters in carrying on their overseas business.

Complete Plans for British Built Ford

Whitehead Aircraft Firm to Co-operate with Dealers in Partly Assembled Car

LONDON, March 11 (*Special correspondence*)—Following recent reports that an effort would be made by the Whitehead Aircraft interests to co-operate with dealers in producing a popular priced car, it is learned that the plan has now taken definite shape.

It is understood that a body of Ford dealers and others have arranged to import some hundreds of parts pending their ability to produce wholly for themselves and to assemble a Ford chassis on a co-operative trading basis.

Report has it that at the time of the armistice there was a stock of Ford imitation and other parts in Great Britain which have been absorbed by the dealers, and also that some of the contributors for these parts are desirous of continuing their output. The experiment is interesting, but the issue is generally considered doubtful of success for lack of capital needed to finance so big a scheme. As a trade venture it will be difficult to attract outside capital to it, unless by way of loan, and such a course is unlikely if the finders of the capital are to be excluded from supervising its use.

It may be added that the Ford company has issued a warning against certain imports of their cars by unauthorized persons. A number of cars from this source have been sold. This does not appear to be in any way connected with the new co-operative production venture of the group of dealers referred to, however. Rumor has it that for the present the parts for the dealers' "Ford" are being imported from American firms which, having built them to Ford orders, have had them left on their hands.

DENY FORD PARTS ORDER

NEW YORK, March 24—Flat denial was made to-day by the Gray-Andrews Corporation, agents in this city for the Cincinnati Screw Company, of reports that an order had been given the screw company by Amalgamated Motors, Ltd., of London, formed by the Whitehead interests, for immense quantities of Ford parts to be assembled in England. Andrews said an inquiry had been received early in the year for \$100,000 worth of parts, but that after an investigation of the situation it had not been accepted.

COAST RATES PROTESTED

NEW YORK, March 24—The National Automobile Chamber of Commerce has protested to the Interstate Commerce Commission against proposed heavy freight rate increases on automobiles and trucks shipped to the Pacific Coast. The commission has informed the N. A. C. C. that no decision has been reached.

"It seems unlikely that the commission would act on the recommendation of the committee of railroad traffic officials in such an important rate adjustment with-

out nearing all parties interested," says a statement of the N. A. C. C. "We believe the case will be opened for this purpose. Both class and commodity rates from points east of Chicago would be advanced, causing heavily increased freight charges on all articles."

Central to Embargo All Small Shipments

NEW YORK, March 24—The New York Central Railroad will declare an embargo on all shipments of less than 10,000 lbs. to all points on its system. The purpose is to release cars for larger shipments. No estimate has been made of the duration of the embargo.

The New York Central's embargo on shipments in carload lots from Canada to points east of Buffalo remains in effect and there is no immediate prospect of raising it. It has added materially to the embarrassment of Canadian shippers who have been troubled for some time by an acute car shortage.

Can't Get Belgian Glass

WASHINGTON, March 24—The Department of Commerce has been advised by Trade Commissioner Herring at Brussels that it is virtually useless to attempt at this time to obtain supplies of Belgian plate glass. Efforts are being made by manufacturers to supply pre-war customers, but no surplus is available for new ones and orders for future delivery are not being accepted. Production is only about 60 per cent normal.

Navy Designs Plane for Speedy Take-off

NEW YORK, March 24—A new plane, which will hop into the air after a very short take-off, has been designed by the Navy for use at sea. It is called the sea-airplane and is designed for operation on board ship where the flight must be started from restricted space.

C. J. Zimmerman, chief test pilot of the Aeromarine Plane & Motor Co., has tested the new machine on and over Raritan Bay. Zimmerman got the machine into the air after a short take-off, which consumed only five seconds. The 300-hp. Hispano motor is expected to develop a speed of 110 miles an hour and to be able to lift the plane 5000 ft. in 10 minutes. Weight, with full load, is 2730 lb.

It is designed to carry a pilot and machine gunner or observer, and the planes are mounted with more than the usual amount of "stagger," so that both pilot and observer can have unrestricted view downward as well as overhead.

BUICK PRICES GO UP

FLINT, MICH., March 22—The following revised prices on Buick automobiles are effective April 1, f.o.b. factory: K-44, \$1,595; K-45, \$1,595; K-46, \$2,235; K-47, \$2,465; K-49, \$2,865; K-50, \$2,895.

Makers Seek End to Freight Car Tangle

Want Cars Turned Over to Industry Without Respect to Ownership

DETROIT, March 23—J. H. Marvin, general traffic manager of the National Automobile Chamber of Commerce, headed a party of Detroit automobile men who left last night for Chicago, Cincinnati, Pittsburgh and other railway centers, seeking relief from the freight car situation.

The party included W. H. McLeod, Buick traffic manager; Preston G. Findlay, Dodge Brothers; J. H. Main, Cadillac; E. H. Hodges, Hupp; C. J. Scharff, Chevrolet, and W. J. Dibble, Hudson.

Freight shipments practically have been suspended since the return of the roads to private ownership. Under private control cars must be returned and used by the roads owning them and the present serious situation is the result largely of the indiscriminate use of cars under government control.

The Michigan Central furnishes a striking example in that only 5 per cent of its 14,000 cars are now in its possession. Others are scattered in various sections of the country. These are chiefly wide door cars suitable for automobile shipment.

The delegation will seek to impress upon officials that all new cars be built with wide doors to accommodate automobiles. At present practically the entire output of factories in this vicinity are being driven to their destinations at enormous cost. To relieve conditions the delegation will ask that indiscriminate use of freight cars be permitted until the rolling stock can be unscrambled from its present tangle.

HEADS PACKARD EXPORT

NEW YORK, March 24—Active management of the Packard Motors Export Corporation has been delegated to Col. Fred Gardway, who has been appointed vice-president and general manager, with headquarters at 1861 Broadway. The corporation will control the Packard business throughout the world, with the exception of the United States and Canada.

TO BAN FOREIGN PLANES

WASHINGTON, March 24—Evidence of plans formulated by foreign aircraft dealers to unload thousands of machines in the United States and to advertise them extensively here has been presented to the Finance Committee of the Senate. The result is that tariff restrictions are favored by the committee to protect American manufacturers.

Senator New of Indiana, strongly advocated the anti-dumping tariff.

TEMPLAR SUES STANDARD

CLEVELAND, March 22—The Templar Motors Co. has filed suit against the Standard Parts Co. for \$1,400,000, for alleged breach of contract in failing to deliver 11,000 axles.

Automobile Exports from the United States by Countries During January, 1920

Countries	TRUCKS				PASSENGER CARS				
	Complete Cars		Chassis		Complete Cars		Chassis		Parts
	Number	Dollars	Number	Dollars	Number	Dollars	Number	Dollars	Dollars
Austria	19	38,250	.....	.....	368	368,329	.....	.....	80
Belgium	19	39,911	2	2,838	87	82,515	.....	.....	23,170
Denmark	.....	.....	.....	.....	1	5,000	.....	.....	258,508
Finland	20	37,412	2	7,348	90	93,115	.....	.....	2,839
France	.....	.....	.....	.....	7	8,915	.....	.....	209,024
Gibraltar	1	2,154	1	1,900	37	68,918	1	525	208
Greece	.....	.....	.....	.....	7	23,574	.....	.....	6,389
Italy	.....	.....	.....	.....	6	6,535	.....	.....	6,169
Malta, Gozo, and Cyprus Island	15	8,838	.....	.....	141	142,189	.....	.....	.....
Netherlands	35	75,694	.....	.....	82	125,010	.....	.....	2,963
Norway	.....	.....	.....	.....	25	21,520	.....	.....	21,040
Poland and Danzig	17	21,107	1	3,440	176	199,003	7	7,723	400
Portugal	.....	.....	40	17,675	1	3,500	.....	.....	15,812
Roumania	4	2,500	.....	.....	10	4,830	.....	.....	17,605
Russia in Europe	20	42,231	.....	.....	117	159,466	.....	.....	2,030
Spain	73	110,947	5	3,855	374	541,029	.....	.....	11,950
Sweden	25	17,153	.....	.....	67	93,837	.....	.....	18,820
Switzerland	47	74,790	.....	.....	33	32,555	.....	.....	7,900
Turkey in Europe	419	656,180	153	228,284	1,296	1,470,897	69	63,256	15,758
England	2	1,741	.....	.....	29	28,311	.....	.....	749,012
Scotland	.....	.....	.....	.....	83	89,763	.....	.....	4,062
Ireland	.....	.....	.....	.....	.....	.....	.....	.....	.....
Jugoslavia, Albania, and Fiume	.....	.....	.....	.....	1	560	.....	.....	100
British Honduras	91	164,176	39	73,227	559	674,425	19	37,795	21
Canada	.....	.....	.....	.....	3	1,612	.....	.....	2,002,250
Costa Rica	1	1,890	1	1,000	22	28,978	.....	.....	1,062
Guatemala	1	900	.....	.....	1	600	.....	.....	1,843
Honduras	4	2,279	.....	.....	46	44,137	.....	.....	3,272
Nicaragua	2	1,006	.....	.....	13	12,692	.....	.....	2,723
Panama	.....	.....	.....	.....	15	24,610	.....	.....	3,848
Salvador	65	79,527	.....	.....	219	201,841	10	3,919	7,067
Mexico	.....	.....	.....	.....	2	2,281	.....	.....	80,316
Newfoundland and Labrador	12	6,045	.....	.....	27	18,455	.....	.....	1,731
Barbados	.....	.....	.....	.....	3	2,166	.....	.....	1,541
Jamaica	.....	.....	.....	.....	9	4,118	.....	.....	9,775
Trinidad and Tobago	4	4,011	.....	.....	266	307,769	.....	.....	8,073
Other British West Indies	79	177,027	4	10,983	4	1,550	.....	.....	1,389
Cuba	.....	.....	.....	.....	3	2,033	.....	.....	108,513
Danish West Indies	.....	.....	.....	.....	4	5,000	.....	.....	280
Dutch West Indies	4	2,715	.....	.....	5	7,749	.....	.....	277
French West Indies	3	4,654	.....	.....	8	10,771	.....	.....	3,690
Haiti	5	8,096	.....	.....	228	306,602	.....	.....	5,829
Dominican Republic	25	21,672	.....	.....	1	4,100	.....	.....	5,298
Argentina	1	5,600	.....	.....	400	382,726	.....	.....	341,062
Bolivia	28	28,520	1	2,100	49	82,461	.....	.....	1,286
Brazil	2	2,379	.....	.....	24	42,566	.....	.....	87,376
Chile	5	4,458	2	2,120	9	12,180	.....	.....	18,734
Colombia	1	3,635	.....	.....	9	10,523	.....	.....	7,844
Ecuador	.....	.....	.....	.....	.....	.....	.....	.....	4,079
British Guiana	.....	.....	.....	.....	.....	.....	.....	.....	1,013
Dutch Guiana	.....	.....	.....	.....	.....	.....	.....	.....	140
Paraguay	8	10,315	.....	.....	51	38,311	.....	.....	1,915
Peru	4	7,466	.....	.....	40	52,849	.....	.....	14,855
Uruguay	9	4,530	.....	.....	294	241,250	.....	.....	21,035
Venezuela	.....	.....	.....	.....	41	42,119	1	800	9,262
Aden	7	12,425	1	1,796	1	1,795	.....	.....	.....
China	.....	.....	.....	.....	124	144,467	2	5,210	28,602
Kwantung	.....	.....	.....	.....	.....	.....	.....	.....	200
Chosen	.....	.....	.....	.....	.....	.....	.....	.....	2,145
British India	29	84,841	.....	.....	189	189,378	.....	.....	48,566
Straits Settlements	25	55,628	.....	.....	123	126,622	.....	.....	38,793
Other British East Indies	1	2,849	.....	.....	12	12,460	.....	.....	1,323
Dutch East Indies	76	161,979	.....	.....	236	270,911	.....	.....	65,000
French East Indies	5	8,198	.....	.....	11	5,713	.....	.....	4,780
Hongkong	1	1,150	.....	.....	8	16,563	.....	.....	2,779
Japan	69	78,605	30	52,071	284	319,690	39	46,265	59,819
Russia in Asia	.....	.....	.....	.....	40	72,000	.....	.....	1,148
Slam	.....	.....	.....	.....	1	1,500	.....	.....	2,307
Turkey in Asia	4	6,180	.....	.....	23	19,386	.....	.....	262
Australia	32	56,046	.....	.....	83	116,521	24	23,661	176,287
New Zealand	23	40,424	.....	.....	439	480,017	.....	.....	72,796
Other British Oceania	.....	.....	.....	.....	5	6,185	.....	.....	170
French Oceania	.....	.....	.....	.....	2	3,000	.....	.....	57
Other Oceania	.....	.....	2	900	3	1,800	.....	.....	1,001
Philippine Islands	16	80,482	16	33,521	348	325,187	.....	.....	67,676
British West Africa	11	10,618	7	6,152	21	21,243	14	17,218	11,520
British South Africa	8	7,212	.....	.....	258	296,273	4	3,641	52,201
British East Africa	.....	.....	.....	.....	1	4,000	.....	.....	.....
Canary Islands	.....	.....	.....	.....	4	4,529	.....	.....	.....
French Africa	.....	.....	2	2,200	.....	.....	.....	.....	3,356
Madagascar	.....	.....	.....	.....	3	3,000	.....	.....	285
Morocco	.....	.....	.....	.....	2	4,520	.....	.....	1,245
Portuguese Africa	.....	.....	.....	.....	1	2,800	.....	.....	.....
Egypt	.....	.....	.....	.....	58	51,982	.....	.....	2,077
Total	1,412	2,276,446	309	451,410	7,680	8,636,887	190	210,013	4,778,626

SHIPMENTS TO NONCONTIGUOUS TERRITORIES:

	COMMERCIAL		PASSENGER		PARTS
	Number	Dollars	Number	Dollars	Dollars
Alaska	3	2,143	4	2,467	1,372
Hawaii	35	29,112	148	126,269	45,589
Porto Rico	45	88,659	180	238,556	61,989

Restrain Ford Use of K-W Spark Coil Ignition Company Wins Suit Charging Patent Infringement —Ford Files Appeal

INDIANAPOLIS, March 22—Judge Albert B. Anderson of the United States District Court has sustained the complaint of the K-W Ignition Co. of Cleveland, alleging infringement of patents owned by that company by the Ford Motor company. The decision was made after several days' hearing of evidence.

The judgment sustained the patent covering the K-W spark coil, extensively used on Ford cars, holding that the Ford company had infringed such patent. Further adjudication was referred to Charles Martindale, master in chancery, to ascertain and report back to the court the number of ignition units made, sold or used by the defendant company and the gains and profits and the damages suffered by the K-W company.

A perpetual injunction was issued restraining the Ford Motor company from making or selling the invention described, with the stipulation that in case of an appeal within 30 days the injunction be suspended and a bond of \$1,000,000 be filed, signed by the defendant company and Henry Ford and Edsel Ford, as sureties. The appeal was taken.

February Exports Show Sharp Drop

WASHINGTON, March 20.—A decided drop in exports was the outstanding feature of the February foreign trade statement issued to-day by the Bureau of Foreign and Domestic Commerce, Department of Commerce.

February exports amounted to \$646,000,000, the smallest since October of last year, against \$722,000,000 in the preceding month of January and \$585,000,000 in February of last year. Exports during the eight months ended with February were \$5,231,000,000, against \$4,383,000,000 in the eight months of last year.

February imports amounted to \$467,000,000, against \$474,000,000 in January of this year and \$235,000,000 in February a year ago. Imports during the eight months period ended with February amounted to \$3,235,000,000, against \$1,933,000,000 a year ago. The imports during these eight months, representing two-thirds of the current fiscal year, exceeded by \$140,000,000 the imports during the entire fiscal year ended with June, 1919.

GRAHAM BUILDS NEW TRUCK

EVANSVILLE, IND., March 19—The Graham Brothers' speed truck, a local product, has a number of up-to-date features, among which is the bolting of the bumper to the frame, instead of riveting. The argument is that if the bumper strikes an obstruction and becomes bent, the straightening process is merely a

matter of removing four bolts and having the damaged part fixed at the nearest blacksmith shop; whereas if rivets were used the owner of the truck would in all probability indefinitely postpone the straightening.

Graham speed trucks are of 1½ tons capacity, with Continental four-cylinder, 3½ in. x 5 in. engine. A three-point suspension is used, and a thermo-syphon cooling system, with Long radiator. Ignition and lighting are by an Eisemann high tension magneto-generator set. Batteries are Prestolite of 60 ampere-hours capacity at 6 volts. A Monarch suction governor is fitted to the engine. The carbureter is a Stromberg. The clutch is the Fuller, as is also the gear-set, which has three speeds forward and one reverse. Front and rear axles are Torbensen. Front and rear springs are half-elliptic, made by the Detroit Steel Products Co. A Lavine steering gear and a Hartford universal joint of metal construction are also among the features.

Van Briggles Takes Over Bower Trailer

INDIANAPOLIS, March 23 — The Bower Trailer Co. of Fowler, Ind., and the H. M. Smith Manufacturing Co. of Mooresville, Ind., have been taken over by the Van Briggles Manufacturing Co. of Indianapolis, which company has been incorporated with a capital of \$1,000,000.

The officers of the new company are L. H. Van Briggles, president; George A. Weideley, first vice-president; Frank Hilgemeier, second vice-president; U. Z. Wiley, secretary; Henry S. Rominger, treasurer; Joseph S. Sheperd, assistant treasurer. Van Briggles, Rominger, Hilgemeier and Wiley have been connected with the Van Briggles Motor Device Co. Weideley is vice-president of the Weideley Motors company.

The Bower trailer, according to Van Briggles, employs a patented device, preventing it from swinging from one side of the road to another. Hereafter it will be sold as the Van Briggles trailer. The factory at Fowler will be enlarged. The H. M. Smith company makes patent crates which are used in practically all the agricultural schools in the United States. Their manufacture will be carried on at Mooresville. The general offices of the Van Briggles company will be established in Indianapolis.

INCREASE FORDSON OUTPUT

DETROIT, March 19—Henry Ford & Son have begun operations in their tractor assembly plant at Des Moines, Iowa, and soon will be turning out 100 tractors a day at that plant. The only delay to scheduled production is in getting parts and materials, due in great measure to railroad congestion. With the Des Moines assembly plant in full operation the daily output of tractors will be increased to 550, the plant at St. Louis turning out 100 and the plant at Dearborn, Mich., shipping 350.

Officials of the Ford company to-day denied a report that an assembly plant would be opened at Colorado Springs.

Briscoe to Merge Bethlehem Truck Plans for Combination of Two Corporations Await Final Action

DETROIT, March 22—Negotiations for the merger of the Briscoe Motors Corp. and the Bethlehem Motors Corp., are rapidly nearing completion, but the details of the combination are not yet obtainable. It is understood, however, that the stockholders of the two corporations will share in the distribution of securities of a new corporation but the proportions of the distribution have not been announced.

The Briscoe corporation has a capitalization of \$6,000,000. It was incorporated in 1916, succeeding the Briscoe Motor company which previously had acquired control of the Mason Motor Co., of Waterloo, Ia., Jackson Motor Parts Co. and the Jackson plant of the Lewis Spring & Axle Co. of Jackson, Mich. It controls six plants located in and about Jackson.

The Bethlehem corporation was incorporated in 1916 to manufacture motor trucks. The capital is approximately \$800,000. Its plant is located at East Allentown, Pa.

Trade Opportunities in Foreign Markets

WASHINGTON, March 20—The Bureau of Foreign and Domestic Commerce, Department of Commerce, has received requests for automobiles or parts agencies of business from individuals and companies in foreign countries. These are listed below. For further information address the Bureau of Foreign and Domestic Commerce and specify the Foreign Trade Opportunity Number.

An importer in Portuguese East Africa desires to purchase and secure an agency for the sale of light motor trucks and motor boat engines. Quotations should be given f.o.b. New York. Correspondence may be in English. Reference. 32280.

An agriculturist and member of a commercial organization in Syria desires to receive catalogs, price lists and discounts on passenger cars and light and heavy automobile trucks. 32296.

An American firm which is about to send a representative to Russia, desires to secure the representation of firms for the sale of automobiles. References. 32325.

A commission agent and wholesaler in Syria desires to communicate with exporters of automobiles and trucks. 32328.

FISK BUYS IN NEW YORK

NEW YORK, March 22—Fisk Rubber Tire Co. has added to the site of its proposed 24-story building at Broadway, Eighth Avenue and Columbus Circle, two adjoining sites. The latest purchases take in the properties at 956-8 and 960-2 Eighth Avenue.

Automobile Tire Exports by Countries for January

	Casings Dollars	Inner Tubes Dollars	Solid Tires Dollars	All Other Dollars
Austria	4,300	.....	.....	.....
Azores and Madeira Islands	285	.....	.....	.....
Belgium	123,114	3,229	3,108	2,096
Bulgaria .....	.....	.....	.....	.....
Czechoslovakia .....	.....	.....	.....	.....
Denmark	130,734	3,202	.....	7,610
Finland	22,402	179	.....	.....
France	346,817	1,648	.....	2,704
Germany	498	.....	.....	.....
Gibraltar	98	.....	.....	.....
Greece	28,770	322	.....	898
Italy	45,998	.....	.....	9,296
Malta, Gozo, and Cyprus Islands	75	.....	.....	.....
Netherlands	89,443	2,103	.....	4,337
Norway	93,859	457	.....	435
Poland and Danzig	1,531	.....	.....	.....
Portugal	109,356	1,627	.....	1,454
Roumania	78,515	2,788	.....	.....
Russia in Europe	1,750	.....	.....	.....
Spain	107,004	.....	.....	1,113
Sweden	306,231	9,399	25	9,143
Switzerland	163,748	.....	.....	15,197
Turkey in Europe	65,753	.....	.....	385
England	61,934	292	16,359	13,970
Scotland .....	.....	.....	.....	4,500
Bermuda .....	.....	.....	.....	.....
British Honduras	323	145	.....	368
Canada	180,454	16,107	41,454	1,565
Costa Rica	1,343	.....	.....	92
Guatemala	2,212	220	.....	.....
Honduras	1,775	19	91	.....
Nicaragua	1,683	.....	.....	.....
Panama	20,869	59	.....	1,947
Salvador	545	30	.....	171
Mexico	39,530	5,998	3,931	2,453
Miquelon, Langley, etc. ....	.....	.....	.....	.....
Newfoundland and Labrador	170	293	.....	.....
Barbados	2,616	61	.....	97
Jamaica	30,856	994	.....	54
Trinidad and Tobago	3,868	88	.....	21
Other British West Indies	2,304	250	.....	158
Cuba	160,960	10,658	7,739	23,617
Danish West Indies	1,749	47	.....	.....
Dutch West Indies	980	.....	.....	12
French West Indies	15,834	25	.....	290
Haiti	2,785	48	.....	1,302
Dominican Republic	10,275	.....	647	111
Argentina	138,197	1,635	.....	870
Bolivia	4,645	.....	.....	.....
Brazil	60,576	3,384	.....	267
Chile	52,912	871	.....	4,162
Colombia	8,447	483	.....	2,528
Ecuador	5,324	.....	.....	.....
British Guiana	2,879	850	.....	.....
Dutch Guiana	257	.....	.....	11
Paraguay .....	.....	.....	.....	.....
Peru	20,266	378	1,839	39
Uruguay	47,773	2,116	.....	.....
Venezuela	11,838	50	.....	739
China	36,603	340	.....	1,105
Kwantung .....	.....	.....	.....	.....
Chosen .....	.....	.....	.....	.....
British India	23,531	222	.....	.....
Straits Settlements	62,097	458	15,311	.....
Other British East Indies	166	.....	.....	.....
Dutch East Indies	56,717	1,075	3,835	327
French East Indies .....	.....	.....	.....	.....
Hongkong	1,725	.....	.....	.....
Japan	11,897	1,542	8,366	.....
Russia in Asia .....	.....	.....	.....	.....
Siam	3,675	.....	.....	.....
Turkey in Asia	9,494	.....	.....	.....
Australia	41,207	3,803	.....	1,038
New Zealand	48,255	475	368	1,068
French Oceania	65	.....	200	.....
Other Oceania	204	15	.....	.....
Philippine Islands	131,397	14,312	18,696	9,457
British West Africa	33,662	23	.....	131
British South Africa	4,627	.....	.....	698
British East Africa	7,453	.....	.....	.....
French Africa	917	.....	.....	.....
Madagascar .....	.....	.....	.....	67
Portuguese Africa .....	.....	.....	.....	.....
Egypt	762	.....	.....	10

Total..... 3,090,924 92,320 121,969 127,919

SHIPMENTS TO NON-CONTIGUOUS TERRITORIES

	Automobile Tires	All Other Tires
Hawaii	\$145,074	\$5,706
Porto Rico	157,885	20,171

Tractor Exhibit to Have Four Settings

N. I. & V. A. Committee Decides on Change from National Show to Sectional

CHICAGO, March 20—There are to be four national tractor shows during the coming year. This was decided upon at a meeting of the National Tractor Demonstrations and Shows Committee of the National Implement and Vehicle Association held in Chicago March 10. The dates and places for the national shows were not selected.

Selection of places and dates for the shows was postponed to give the committee an opportunity to secure more information on the provisions offered for local management of such shows, location, amount and character of space available, the price to be charged for them, provisions offered for publicity, and hotel accommodations.

For several years past it has been felt the idea of holding one national tractor show has been outgrown. It has been pointed out that tractors suitable for one section of the United States are not suitable to another, and it is also impossible to secure a representative dealer attendance from all parts of the country when the show is made one big exposition. Both the manufacturers and the dealers are behind this movement, and the abolition of the national show comes as a national outgrowth of the expansion of the tractor business.

While no definite plans for the four shows program have been completed it is understood that one of the shows will be held in some city in the East, another in the Middle West, another farther west, and the fourth somewhere in the South-west. The determination of the cities which draw the exhibits will be based upon the provisions offered for local management and upon the other features of the situation which are now being investigated by the shows committee.

STOVER ADDS TO PLANT

FREEPORT, ILL., March 19—The first unit of a group of buildings which will eventually cover the entire tract of 40 acres now owned by the Stover Gasoline Engine Co. of Freeport, has been completed. The dimensions are 77 x 460 ft. The structure will be devoted exclusively to the manufacture of hopper-cooled engines. The building formerly used for this purpose will, in the future, be utilized for the construction of fuel oil and heavy engines. The Stover company has at present 900 men on the pay-roll.

DIESEL DESIGN ADOPTED

LONDON, Feb. 26 (*Special correspondence*)—The American Chamber of Commerce in London is informed that the great engineering and shipbuilding firm of Armstrong Whitworth, realizing the vital interest of the rapid production of British merchant shipping, and the great

future of the Diesel engine for ship propulsion, have acquired a license to manufacture and sell in Britain and her Colonies two-cycle Diesel marine engines embodying the best features of the Sulzer system.

The two-cycle principle, the American Chamber points out, has been adopted on account of the proved reliability and efficiency of this type of engine, its high ratio of horsepower to size and weight, and its ability to run on the cheapest fuels now on the market. It is understood that engines of this type, aggregating over 600,000 b.h.p., have already been built, and the experience gained in regard to both design and manufacture will be available in the production of the new engines.

Crossley-Willys Merger Only Partial

LONDON, Feb. 27 (*Special correspondence*)—At the annual meeting this week of the shareholders of Crossley Motors, Ltd., in Manchester, it was explained by the chairman, Sir Kenneth Crossley, that Crossley Motors, Ltd., had made no financial amalgamation with the Willys-Overland Co. of America. All they had done was to exercise their option on the Heaton Chapel Works and to resell those works to the new company at a fair price.

The only direct connection between Crossley Motors, Ltd., and Willys-Overland-Crossley, Ltd., apart from their shareholding, was that he (Sir Kenneth) was the chairman and Letts the managing director of both companies. Despite a generally optimistic statement of the Crossley company's affairs, the shares perceptibly weakened after the meeting.

ENGLISHMAN.

HIGHWAY TRAILER EXPANDS

EDGERTON, WIS., March 19.—The Highway Trailer Co., Edgerton, Wis., will commence work March 15 on another large factory addition, to increase the daily output to 25 trailers. On March 1 the company held \$250,000 of certified orders on its books for immediate delivery.

The Continental Axle Co., an affiliated corporation, has reached a daily production of 18 axles and the installation of much new equipment at this time will make it possible to increase the output to approximately 50 a day by May 1.

Joint branch offices have been established at Toledo and Cleveland.

James W. Monhall is general manager of both concerns.

PROMOTE SWEDISH AIR LINES

NEW YORK, March 19.—Two air line companies offering service between Sweden and Finland are in course of formation, according to dispatches from Abo, Finland, published in recent issues of London newspapers. Of the two companies, one, the Svenskt Lufttrafikbolag, is supported by Swedish capital, while the second, the Flygkompaniet, is being backed by English interests.

Define Classes for R. A. S. Tractor Trials

Prizes to Be Awarded for Seven Distinct Tests, Entries Close March 27

LONDON, March 3 (*Special correspondence*)—Entries for the British 1920 tractor trials promoted by the Royal Agricultural Society, with whom the Society of Motor Manufacturers and Traders are collaborating, will now be accepted up to March 27.

Slight alteration has been made to the regulations and there are now seven classes instead of six as formerly. It will be noted that what was class 1 has now been divided up into classes 1 and 2, the first being for tractors of 24 hp. and under, the second for tractors of 30 hp. and under. The remaining classes remain unaltered, except as to their consecutive number, which has been altered in accordance with correction noted. The revised list of classes follows:

Class 1—First prize, gold medal and £20. Second prize, bronze medal and £10. Internal combustion direct traction engine not exceeding 24 hp., suitable for plowing 2 furrows, 10 in. wide by 6 in. deep.

Class 2—First prize, gold medal and £20. Second prize, bronze medal and £10. Internal combustion direct traction engines, suitable for plowing 3 furrows 10 in. wide by 6 in. deep.

Class 3—First prize, gold medal and £20. Second prize, bronze medal and £10. Internal combustion direct traction engine over 30 hp., suitable for plowing 4 furrows 10 in. wide by 8 in. deep.

Class 4—First prize, gold medal and £20. Second prize, bronze medal and £10. Direct traction steam engine plant, suitable for plowing 4 furrows 10 in. wide by 8 in. deep. Engines to comply with the Light Road Locomotive Acts.

Class 5—First prize, gold medal and £20. Second prize, bronze medal and £10. Internal combustion double engine set, with wire rope haulage for plowing 3 or 4 furrows 10 in. wide by 8 in. deep. Engines to comply with the Light Road Locomotive Acts.

Class 6—First prize, gold medal and £20. Second prize, bronze medal and £10. Double steam engine set, with wire rope haulage for plowing 3 or 4 furrows 10 in. wide by 8 in. deep. Engines to comply with the Light Road Locomotive Acts.

Class 7—First prize, gold medal and £20. Second prize, bronze medal and £10. Self-propelled plow for plowing not more than 4 furrows and not more than 10 in. wide by not more than 8 in. deep.

TRANSPORT PRICES RISE

MT. PLEASANT, MICH., March 19—The Transport Motor Truck Co. has advanced prices on the 1, 1½ and 2½ models. The 1-ton model is advanced from \$1,750 to \$1,850; the 1½-ton from \$2,050 to \$2,250, and the 2½-ton truck from \$2,585 to \$2,780.

Traction Engine Exports by Countries for January

Countries	Gasoline		Steam		Kerosene	
	Number	Dollars	Number	Dollars	Number	Dollars
Belgium	19	22,088	.....	.....	.....	.....
Denmark	3	3,153	.....	.....	.....	.....
France	613	371,477	.....	.....	373	147,907
Gibraltar .....	.....	.....	.....	.....	1	524
Netherlands	36	47,715	.....	.....	.....	.....
Norway	1	301	.....	.....	1	259
Poland and Danzig	17	16,770	.....	.....	.....	.....
Portugal	1	1,025	14	41,851	.....	.....
Spain	1	1,899	.....	.....	.....	.....
Sweden	55	56,721	.....	.....	.....	.....
Switzerland	1	1,625	.....	.....	6	730
Turkey in Europe .....	.....	.....	.....	.....	1	1,049
England	169	185,037	.....	.....	342	299,549
Scotland	1	796	.....	.....	.....	.....
British Honduras .....	.....	.....	1	765	1	128
Canada	226	164,642	1	1,600	392	300,441
Costa Rica	4	2,800	.....	.....	.....	.....
Guatemala	11	11,749	.....	.....	1	158
Honduras .....	.....	.....	2	11,455	.....	.....
Nicaragua	1	5,000	.....	.....	.....	.....
Salvador .....	.....	.....	.....	.....	1	247
Mexico	35	55,250	6	8,923	.....	.....
Newfoundland and Labrador .....	.....	.....	.....	.....	11	2,268
Jamaica	1	1,202	.....	.....	.....	.....
Cuba	19	54,343	7	7,866	9	11,166
Danish West Indies .....	.....	.....	.....	.....	1	150
Haiti	1	1,755	.....	.....	.....	.....
Dominican Republic .....	.....	.....	.....	.....	2	890
Argentina	23	26,802	.....	.....	134	24,178
Bolivia	9	3,519	.....	.....	.....	.....
Brazil	1	1,875	.....	.....	3	3,907
Chile	33	30,253	.....	.....	9	6,553
Ecuador .....	.....	.....	.....	.....	4	600
Dutch Gulana .....	.....	.....	.....	.....	2	1,200
Peru	28	19,016	1	1,838	1	2,012
Uruguay	14	10,210	.....	.....	.....	.....
Venezuela .....	.....	.....	.....	.....	1	95
China	1	3,050	.....	.....	2	964
British India	1	265	.....	.....	.....	.....
Straits Settlements	4	5,276	.....	.....	.....	.....
Other British East Indies	16	10,160	.....	.....	.....	.....
Dutch East Indies	19	23,245	3	7,100	.....	.....
French East Indies	3	1,878	.....	.....	.....	.....
Japan	6	3,782	1	1,926	.....	.....
Siam	2	1,278	.....	.....	2	782
Greece	2	2,900	.....	.....	.....	.....
Turkey in Asia	1	1,750	.....	.....	.....	.....
Australia	10	7,950	.....	.....	.....	.....
New Zealand	46	40,881	.....	.....	.....	.....
Philippine Islands	241	268,864	9	24,673	21	5,277
British West Africa .....	.....	.....	.....	.....	1	143
British South Africa	23	14,105	.....	.....	3	1,224
French Africa	2	10,122	.....	.....	.....	.....
Morocco	6	8,447	.....	.....	.....	.....
Total	1,706	1,500,965	45	107,997	1,325	812,351

PARKER EXPANDS PLANT

INDIANAPOLIS, March 18—The expansion of the capital of the Parker Tire & Rubber Co. from \$750,000 to \$3,000,000 and improvements and additions to the factory buildings will greatly enlarge the output of the plant here. Tentative plans call for an expenditure this year of approximately \$500,000 on the new main factory structure. The building will be

600 x 100 ft. two stories high, of steel, brick and concrete construction. On the factory plot, which is owned by the company, it is also proposed to erect a two-story administration building. With the addition, facilities for the employment of 1500 men will be provided. It is estimated that the output of cord tires within the next ten months will be increased to a daily average of about 500.

FOUNDRY ADDS TO CAPITAL

NEWARK, OHIO, March 18—At the annual meeting of the stockholders of the Newark Stamping & Foundry Co. the following directors were elected: J. N. Pugh, H. W. Moser, R. A. Gulick, Goodnow Johnson, R. G. Barber, D. F. Sites and F. Ball. An increase in the capital stock of the company from \$15,000 to \$30,000 was authorized.

French 12 Cylinder Car Soon to Appear

Corona, Designed by Michaux, to
Sell for \$15,000—Has Five
Year Guarantee

PARIS, March 6 (*Special correspondence*)—The first 12-cylinder car to be built in France will shortly be put on the market. This is known as the Corona, and is listed at \$15,000 for chassis only with tires, two spare wheels, tools and equipment.

The Corona has been designed by G. Michaux, a consulting engineer, who some years ago was responsible for the design of the small Peugeot racing cars. Cylinder dimensions are 3.1 x 4.7 in., the cylinders being cast in two sets of six, and mounted at an angle of 40 deg.—this latter arrangement being new in automobile practice. Valves are carried in cages in the head and are operated by means of camshafts in the base-chamber, pushrods, and rockers. All the valve operating mechanism is enclosed, the cover also hiding the spark plugs and the ignition wires. The crankshaft is carried in three roller bearings, with a double thrust ball race at the fly-wheel end.

One of the features of this engine is the dry sump oiling system. All the oil is contained in a tank around the base chamber, and is delivered to the bearings under pressure. The excess from the bearings, which falls into the basechamber, is collected by a scavenging pump and returned to the oil tank. Fresh oil is poured in through a cap on the top of each cylinder casting.

In addition to this, there is a central oil tank in the dash, from which lubricant is delivered automatically to the gearbox, the rear axle, the front axle, the steering connections, shackle bolts and springs. No oil can is required on this car. Naturally, there is no return from the parts fed by the accessory tank.

Unit Construction Adopted

Unit construction of engine and gearbox has been adopted, with three speeds and reverse, center control, and either left or right hand steering. The drive shaft is enclosed, and there is a flexible metal cover around the universal behind the gearbox, allowing oil to be delivered from the gearbox to the universal, and from there to the rear axle. This latter is a full floating type, specially designed for rapid dismounting of the differential housing, the crown wheel and the driving pinion. Spiral bevel gears are used.

Brakes are fitted on all four wheels, the drums being 16½ in. in diameter and 2.3 in. in width. No brake operating rods are visible, and at the front the brake lever is passed inside the steering pivot. The stub axles are hollow, with a diameter of 2.5 in., which is also the diameter of the rear axle. The hubs are interchangeable front and rear, and detachable metal wheels are employed. The car has electric lighting and starting,

ignition by two magnetos with automatic advance, speed indicator and revolution counter, and an engine-driven tire pump.

The Corona is guaranteed for five years, this guarantee extending to any number of owners, providing the seals are not broken. After 60,000 miles running the makers undertake to completely overhaul the car at an inclusive charge of \$1,000.

Rumors of Motor Crisis Stir England

LONDON, Feb. 27 (*Special correspondence*)—The London *Daily Express* of Feb. 26 has a scare article under the title of "Motoring Trade Crisis," in which it is roundly stated that "nearly twenty makers (British) known to the writer 'are in difficulties,' and some even on the point of bankruptcy." The cause is attributed to failure of optimistic plans of output to be realized. These difficulties, it is added, are not limited to the smaller and less known firms.

When in the Birmingham area this week, the writer failed to get corroboration of the more serious aspects of this rumor, but it was evident that credence was attached to rumors at large, or perhaps it would be safer to say that there is a suppressed state of unrest and anxiety and that much of it is the result of the unfortunate step in holding the Olympia show under the conditions prevailing.

ENGLISHMAN.

REORGANIZE FAN COMPANY

SOUTH BEND, IND., March 19—Reorganization of the American Aero Co. of Chicago, manufacturer of the Juelson two-bladed fan for automotive vehicles, has just been completed. The administrative offices of the company are now located in South Bend and the following officers have been elected for the year: F. H. Wellington, president; George M. Studebaker, vice-president; Paul V. Harper, secretary; F. H. Wellington, George M. Studebaker, Clement Studebaker, Jr., Edward S. Hyman and Edwin Juelson, directors.

NEW MORSE CHAIN OFFICES

ITHACA, N. Y., March 19—Two new offices have been opened by the Morse Chain Co., manufacturer of automotive equipment. A Baltimore office is located in the Lexington Building, under the management of E. R. Morse, and a Philadelphia office in the Harrison Building, under the management of M. H. Rodda.

FIRM TITLE CHANGED

MERRITON, ONT., March 19—General Forgings & Stampings, Ltd., is the new name of the Canada Pole & Shaft Co., Ltd. It has been deemed advisable to change the name owing to the fact that the business has changed from that of a pole and shaft business to that of an automobile forging and stamping business.

Fremont to Build New Passenger Car Company Takes Over Taylor Motor Truck Co.—Plans 6-Cylinder Job

DETROIT, March 19—Fremont Motor Corp., headed by R. T. Walsh, advertising manager of King Motor Car Co., and composed of Detroit manufacturers, has taken over the plant and assets of the Taylor Motor Truck Co., at Fremont, Ohio, and will build a six-cylinder passenger car. Final steps in the deal came yesterday in an order from the Federal court in Toledo, directing the receiver of the Taylor company to sell the assets to the new corporation.

The corporation is capitalized at \$2,000,000, all common stock of the par value of \$10, \$250,000 of which will be put on the market. The car to be manufactured will sell at \$1,850, and will be powered with a Falls engine and standard equipment. The new owners take formal control of the property to-day, and expect to be in production within a few weeks. The output of the plant for 1920 has been contracted for on an export order.

Formal announcement of the personnel of the new organization will be made following a meeting of the temporary board. The syndicate is the same as the one which last week secured control of the Fulton Motor Truck Co., of which Garvin Denby, former president of the Denby Truck Co., is the new president. The Gray Bond Co. of Detroit has underwritten the stock for the Fremont Motor Corp., and handled the financing of both deals.

The plant at Fremont, which covers 70,000 sq. ft. of floor space, was built by the Burford Motor Truck Co. The Taylor organization took charge of the plant three years ago, and installed considerable new machinery and equipment, but after a short period of operation went into the hands of a receiver. It was to clear title to these assets that the proceedings were filed in the Federal court to instruct the receiver to proceed with the sale.

Old Truck Material Sold

Included in the property secured was \$60,000 worth of materials for trucks. The new owners, however, found such a profitable market for the material that they decided it would be a wise plan to dispose of it rather than manufacture trucks. For the present production will be devoted entirely to passenger cars, though it is possible the corporation may take up the truck end later. The plant is fully equipped with modern machinery, and production will proceed as rapidly as materials can be secured. An addition increasing the floor space to 150,000 sq. ft. will be erected in the summer.

The new car was designed by F. M. Guy, chief engineer for the Apex Motor Car Co. at Ypsilanti, Mich. Guy was the originator of the torpedo body and the streamline.

N.A.C.C. Active in Motor Route Growth

Special Activity of Chamber Being Extended to Forming New Lines

NEW YORK, March 20—Broadening of the rural motor express movement is one of the subjects upon which most stress is laid by Alfred Reeves, general manager of the National Automobile Chamber of Commerce, in a report to the directors upon the work being accomplished by the organization. It is pointed out, however, that big problems of readjustment and reconstruction are being met and solved in all branches of the automotive industry.

Intensive development of the motor truck as a means of marketing and interurban transportation has been undertaken by the motor truck division of the N. A. C. C. Among the activities noted by Reeves are:

Plans for supplying ten trucks for use by the engineering division of the National Research Council in an investigation to determine a basis for economical grades on rural highways.

Expansion of the rural motor express movement by the formation of the National Association of State Marketing Officials with membership from twenty states.

Operation of approximately 4,000 motor express lines in 48 states, covering routes from 6 to 250 miles long and using from one to twenty trucks.

Requests from universities for details of engineering courses in highway transportation.

Survey by Department of Agriculture

of motor trucks on the farm, showing more than 50,000 now in use.

Attendance by members of truck division of N. A. C. C. at hearings on truck line franchises in various states and an educational campaign to demonstrate the advantages of truck use.

Continued progress in the development of highways also was recounted by Reeves. Hearings will be held soon on the \$425,000,000 national highways bill. Alarm is expressed at the tendency in some states to pass highway bonding measures with the provision that interest on the bonds shall be paid from motor vehicle fees. The highways committee of the N. A. C. C. feels that road construction should be paid for from general funds because they benefit everyone, but does not object to motor vehicle fees being used for maintenance.

It is the open season in state legislatures for bills aimed at motor vehicles. Some of the more than 700 measures proposed are very drastic. South Carolina has passed a law imposing a fee of \$350 on seven ton trucks besides giving the highway commission authority to determine what trucks shall be used in the state. There is a tendency to restrict the size and weight of automobiles in Kentucky, Mississippi, New Jersey and Rhode Island.

Senator Pittman, chairman of the interstate commerce committee, has announced that attention will be given to a bill which would provide that when an automobile has complied with the registration laws of its own state it can travel legally in any other state.

American manufacturers have joined with British makers in devising a cable code in English of automobile terms which is expected to result in a big saving in cable tolls.

Soviets Slow Down Harvester Output

Moscow Plant of International, Though Still Operating, Finds Conditions Difficult

NEW YORK, March 20—The régime of the Soviets in Russia has not halted the operation of the plant of the International Harvester Co., near Moscow. Throughout the changing conditions in the empire of the former czar production has been maintained steadily. It is perhaps the only big plant in the country that has not been nationalized.

There are 1,000 workers employed at the plant at the present time as compared with 2,000 in 1913. The output of the plant is far lower than in former years, however, indicating the slackening of morale which has crept in with government changes. Illustrating this it is shown that production now in a given time is but 800 as against 4,000 in a corresponding period in 1913.

There are 14,000 new machines in warehouses, according to most recent reports, which are lacking knives and without means for the present of procuring them. The machines, it is noted, are desperately needed for the 1920 crops.

PROVIDE FOR COAST MAILS

WASHINGTON, March 19—Appropriations of \$1,415,000 have been provided in the Senate Post Office bill for the purchase and maintenance of airplane mail service between New York and San Francisco via Chicago and Omaha.

An important provision in the bill allows the Postmaster General to contract with individual firms or corporations for airplane mail service between such points as he may deem advisable, providing the cost is not materially greater than by rail. The sum of \$60,000,000 is provided for inland transportation and this money is also available for contract airmail service.

The Secretary of War is authorized to turn over motor vehicles, airplanes and parts, together with machinery to the Post Office. By another provision in the bill, the Postmaster General is authorized to use these for the transportation of mail, and to make the necessary bills for replacement, maintenance, etc.

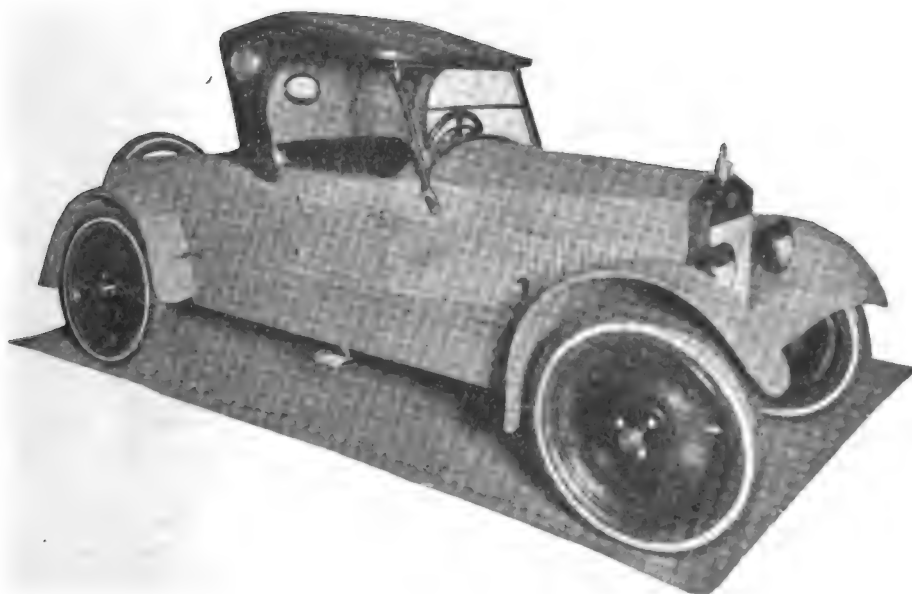
FIAT DENIES RACING RUMOR

NEW YORK, March 24.—Reports that the Fiat company intends to build special freak racing cars in the hope of lowering the world's flying kilometer record were denied to-day at the office of the company here. It was said the Fiat company has no short distance racing cars under construction.

MAY QUARANTINE STATES

WASHINGTON, March 24.—A public hearing to determine whether the states of Louisiana and Texas should be quarantined because of the appearance of the pink bollworm has been set for April 6 by the Department of Agriculture.

The Victory Car, a Boston Product



The Victory car, an assembled job, on a 115-in. wheelbase, is made in two- and four-passenger roadster and brougham models. The factory is in Boston

Gasoline Prices a Bogey, Says Reeves

No Cause for Alarm, Says Manager of N. A. C. C.—Reaffirms Economy Campaign

NEW YORK, March 24—Fear of skyrocketing gasoline prices in the near future is more or less of a bogey, in the opinion of Alfred Reeves, general manager of the National Automobile Chamber of Commerce. He said to-day that while prices undoubtedly will continue to advance they will not go up by leaps and pointed out that even if there was a jump of 5 cents a gallon it would mean an addition of only \$20 a year to the bills of the average motor car owner.

In the investigation which he has been making for the N. A. C. C. he has found indications of profiteering in some sections of the metropolitan district, Reeves said. While the latest wholesale price fixed by the Standard Oil is 28½ cents a gallon, the retail price in Greater New York ranges from 31 to 35 cents. The lower price would represent a fair profit. Attempts to take an unfair advantage of customers will soon be abandoned, Reeves thinks, because car owners will refuse to patronize the men who demand too high a margin of profit.

One solution of the problem is to preach gasoline economy, day and night, Reeves believes. He said the N. A. C. C. had urged the National Automobile Dealers' Association to conduct a nation-wide campaign for a uniform charge of \$1 for adjusting carburetors, on the theory that this step would result in a large saving of fuel. Another advantage would be that the dealer would be brought into constant contact with his customer.

Reeves explained that a reasonable increase in gasoline prices was to be expected, and that the cost probably will continue to creep up gradually unless new sources of supply are found in Mexico. The most serious phase of the situation so far as the automotive industry is concerned, is the rapid extension of oil burning engines on ships and on shore.

Pierce-Arrow Shows Drop in Earnings

NEW YORK, March 25—The annual report of the Pierce-Arrow Motor Co., issued yesterday, shows net profits for 1919 after charges and Federal taxes of \$2,491,070, or \$6.75 a share on its common stock after deduction of preferred dividends, which contrasts with \$7.86 a share earned in 1918.

Net earnings, the report shows, were \$3,161,122 against \$4,273,172 for 1918. Federal taxes totalled \$600,000 as against \$1,200,000. Preferred dividends of \$800,000 were paid and \$312,500 on the common, contrasted with \$1,562,500 in 1918. The surplus for 1919 was \$1,378,570 and the total surplus to December 31, was \$3,571,570.

"Necessary war expenditures in buildings and machinery have left the com-

pany with facilities in excess of normal requirements," President Jay told stockholders in his annual statement. "Time will be required to make the necessary adjustments for the proper utilization of these facilities. Plans for the present contemplate increased production in passenger cars and trucks which should result in a reduction of overhead expenses and lower costs."

The Horse's Knell

DENVER, March 23—Horses will be banished from the streets of Denver after Jan. 1, 1925, if an ordinance now before the City Council is passed. The measure provides that no horses, cattle, sheep or swine shall be kept within the corporate limits of Denver or driven upon the streets.

Car Increases Make Gas Rise Inevitable

WASHINGTON, March 19—Higher prices for gasoline are foreshadowed by a report issued to-day by the Bureau of Mines. Gasoline production, according to the report, increased 10 per cent in 1919. Automobile registrations, according to figures secured by AUTOMOTIVE INDUSTRIES, increased 23.2 per cent during the year. And as the quantity of gasoline in storage has been increasing slowly while sales of automobiles promise even greater increases this year, it is inevitable, state various officials, that gasoline, by reason of the demand, will advance in price.

On Dec. 31, 1919, 292 refineries were operating with a daily capacity of 1,356,355 bbl. of crude oil. In 1917 there were 245 companies producing 1,157,875 bbl. daily, and in 1918, 267 concerns refined 1,226,175 bbl. a day. Ninety-nine new refineries are in process of construction and will be in operation by August, 1920. Texas leads in new construction with 50 plants with daily capacity of 141,000 bbl.

Must Sue Without Inspection of Books

NEW YORK, March 25—The United States Supreme Court has declined to review the proceedings of the United States District Court and the United States Circuit Court of Appeals, in the petition for the right to inspect the books of the B. F. Goodrich Co., and the Firestone Tire & Rubber Co., sought by Louis De F. Munger.

The right to inspect the books, sought as a preliminary to a suit for infringement of demountable rim patents, was denied in the Federal courts until such time as the proceedings of the actual trial warranted. William A. Redding, of the law firm of Redding and Greeley, counsel for the plaintiff and appellant, said the suit for damages would be moved in Federal court in New York in September or January, 1921.

Alleges Oil Firms Seek Trade Control

Texas Attorney Finds Danger of Automobile Business Passing to Refiners

AUSTIN, TEX., March 22—Information has been placed in the hands of the State Attorney General's Department by T. J. Newton, county attorney of Bexar county, at San Antonio, alleging that combines have been entered into by several of the large oil corporations operating in Texas for the purpose of not only controlling the price of gasoline but of exercising control over the prices of automobiles and automobile accessories. He asks that the Attorney General institute suits against these companies for alleged violations of the anti-trust laws of Texas. Attorney General C. W. Cureton took the matter of prosecuting the oil companies under advisement.

Newton charges that these large oil companies are reaching out to control the automobile business, in addition to controlling the prices of their own products. He said that in San Antonio and elsewhere in Texas the big oil companies have installed automobile equipment supply houses in connection with their gasoline filling stations.

In speaking of the situation, Newton said:

"From what I can gather the oil companies are seeking to establish a complete monopoly of their products, and prices checked by the enforcement of our anti-trust laws and laws against monopolies, will eventually absorb or force into retirement, all independent refineries and all of the distributors not in with them, and the consumer will hold the bag."

He declared that under both the State and Federal laws it is possible to check the further operation of combines, saying:

"Just Another Packers' Trust"

"Under the laws of the United States and the State of Texas a check can be placed upon these oil companies. These laws must be put into operation without delay, otherwise, ere long, the consumer will not only have to buy his equipment and supplies from the oil companies, but they will also have to look to the oil companies for their automobiles. Just a repetition of the 'Packers Trust.'"

"The Attorney General's Department had made some investigation of the question, prior to 1918," he said. "I supplied results of an investigation covering the period since that date, and tendered my services and information to him, and asked him to either come personally to San Antonio or send a representative here to begin a further inquiry, if he deemed it necessary before taking legal action."

Newton believes that the information he had at hand is sufficient to authorize legal proceedings and favors immediate institution of suits which he believes will result in either dissolving the big companies or compelling them to reduce prices.

Tractors in Demand in Foreign Climes

Consular Reports Show Strides in Agricultural Development in Many Parts

WASHINGTON, March 24—Increasing demand for tractors in various parts of the world is recorded in consular reports received by the Department of Commerce.

The sugar cane crop in Cuba is the only one which justifies the use of tractors and about 1000 are in use on the island. The round wheel and crawler types are about equally popular. The small farm tractor is the best for size. Most of the sugar lands are rented out in small parcels by the owners of large estates. Long time credits are extended to purchasers by dealers, necessitating the granting of credits by the exporters.

Little progress has been made in Beluchistan and northwestern India in the application of scientific farming methods. Most of the plowing is still done by bullocks. Plans for extensive irrigation are maturing rapidly and when they are put into effect probably will stimulate the demand for tractors. British manufacturers are finding difficulty in making deliveries and for that reason American makers will find their road to business easier. Time of delivery is at present an even more important factor than price.

Tractors have been introduced on the island of Martinique to such an extent in the past two years that use of the mule to drag heavy loads has almost ceased. About seventy tractors are now in use to haul heavy freight and do work about the factories. One crawler has been imported, possibly for plowing purposes. The highways of Martinique are suitable for motor vehicles and therefore favor the use of tractors for hauling.

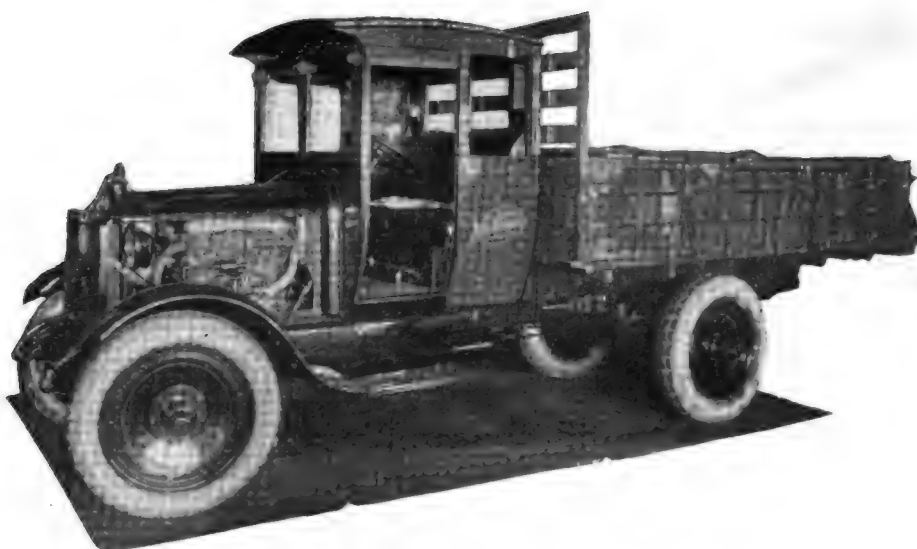
Malaga makes a good distributing center for tractors as most of the country is rolling and hilly. The tractor most adaptable to this region is one suitable for use on hilly ground. One not exceeding four feet in height would be most useful so that it could be used for cultivating between the olive trees without injuring the low-hanging branches.

NAVY GETS AIR FUNDS

WASHINGTON, March 19.—Appropriations amounting to \$15,800,000 for Naval aviation are contained in the Navy appropriation bill reported to the Senate by the Naval Affairs Committee. The appropriations authorize small seaplanes, dirigibles and six aviation bases in continental United States on sites to be selected later.

TRUCKS SUPPLANT RAILROAD

KANSAS CITY, March 24—Motor trucks are being used successfully to fill the needs of the communities along the Kansas City Northwestern Railroad, which suspended operations several months ago. It was the first test of the truck as a substitute for the railroad in



The Northway, New Massachusetts Truck

The Northway truck, manufactured at Natick, Mass., is being produced in 2- and 3½-ton models

this section. Two regular trucking lines are in operation on the highways to Tonganoxie, Kan. They make daily trips from Kansas City carrying foodstuffs and other merchandise to the towns along the way, doing contract hauling for merchants and farmers. Much of the live stock marketed in Kansas City is brought in by trucks.

France Lays Plans for Aerial Routes

NEW YORK, March 24—Six international aerial routes have been proposed by France, according to a recent announcement by M. Flandin, Under-Secretary for Aeronautics of that country, the details of which have just reached this country. State subsidies, the information sets forth, will be granted to French companies employing French pilots and mechanics, and landing places will be established on air routes throughout France. These will be mapped out by the State Director of Aerial Navigation.

The proposed international routes are as follows:—

- Paris-Abbeville (for London)
- Paris-Tours-Angouleme-Bordeaux-Bayonne (for Spain)
- Paris-Valenciennes (for Brussels)
- Paris-Strasbourg (for Central Europe)
- Paris-Dijon-Lyons-Marseilles-Balearic Islands (for Algiers)
- Paris-Nice-Corsica (for Tunis)

SCHWARTZ TRUCK TO BUILD

READING, March 24—The Schwartz Motor Truck Corp. announces that work will be started this spring on its plant, which will be located on a 10½-acre site in this city. The floor space which will be required to house the various departments will approximate 90,000 sq. ft. The company is capitalized at \$1,500,000, with Henry B. Schwartz as president and general manager.

New York to Cut Down on Publicity

Publishers' Association to Give Space Only to Items of Real News

NEW YORK, March 24—The path of the publicity man threatens to become increasingly difficult in the metropolitan district, partly as the result of a boast made by an automobile company that it had obtained an unprecedented amount of free publicity in connection with the New York show.

L. B. Palmer, general manager of the Publishers Association of New York City, said today that the entire subject had been referred to a special committee which has not yet formulated its report. Palmer said, however, there was little doubt the committee would advise that all kinds of publicity be scanned hereafter with the utmost care.

The publishers have been actuated in their stand, he stated, by the scarcity of print paper which has necessitated a general cutting down of the space devoted both to news and advertising. He gave it as the general opinion of New York publishers that they were giving altogether too much room to publicity in which the news value was negligible. It was explained however, that there was no intention of placing an embargo on actual news relating to the automotive industry.

ENTER TRUCK TOUR CONTEST

OMAHA, March 22.—Several large manufacturers of motor trucks have promised entries in the National Motor Truck Reliability Contest. The Douglas Motor Car Co., of this city and the Napoleon Motors Co. of Traverse City, Mich., have led the way with entries. The date for the "run around the money belt" has not been set but will be decided after the trip of the pathfinder.

Townsend Road Bill Opposed on Coast Road Building in Public Land States Threatened by Measure, Oregon Says

PORTLAND, ORE., March 20—War on the Townsend bill creating a Federal highway commission, now before Congress, was declared at a state-wide conference of good roads workers of Oregon held here at which it was asserted that the passage of the Townsend bill would seriously handicap, if not kill outright, so far as Federal assistance is concerned, the road building programs now under way in Oregon and other public land states.

The Oregonians propose a defensive alliance of all the public land states against the Townsend bill and for the Chamberlain bill, appropriating \$100,000,000 a year for five years to continue the present federal co-operation with the states.

In 1916, the Oregonians point out, Congress passed the first Federal aid road law, appropriating \$75,000,000. In 1919 this was amended and \$200,000,000 was appropriated. Out of this \$275,000,000, Oregon's share is \$4,332,178.27. Unless there is another appropriation the last of these funds will be distributed by June 30, 1921. Congress is now asked to appropriate \$100,000,000 for five years in addition to the past road money, and this appropriation must be approved at the present session, they assert, if the present scope of road work is to be carried on.

Under this \$100,000,000 a year measure, which follows the program approved by the Louisville, Ky., convention of state highway engineers and commissioners, held last December, Oregon would receive \$1,576,152 for five years, and \$700,000 a year from an appropriation of \$10,000,000 a year for ten years, for the building of county and state roads within the national forests. In the past Oregon received \$596,000 of the \$3,000,000 forest road fund, which will be exhausted June 30.

Bill Centralizes Road-Building

The objections made by Oregon and the other public land states to the Townsend bill are that it centralizes road building of the government in the hands of a few men and does away with the co-operation between state highway commissions and the government which now exists; that practically none of the public roads in Oregon and the other public land states can qualify under the Townsend bill specifications whereby states will be reimbursed for construction of roads already built; that there are many such roads in the eastern states, which would accordingly obtain a big bulk of the money; and that, in short, it does not take into account the peculiar road building problems of the western public land states, with vast areas of government lands withdrawn from taxation, and completely upsets the

road programs of these states, so far as Federal aid is concerned.

Oregon is at present carrying out a road building program which by the end of next year will have expended \$30,000,000, including Federal aid under the present co-operative system. A measure appropriating an additional \$10,000,000 bond issue for roads is before the voters at the primary election in May.

British Erect Towers for Mooring Airships

LONDON, Feb. 19 (*Special correspondence*)—According to the American Chamber of Commerce in London, the steel towers now in course of construction at the Vickers' Barrow works, will enable airships moored to them to be supplied with fuel, water, gas and goods, while the crew and passengers will also go aboard from the tower.

When completed, says the Chamber, the construction will be about 150 ft. high, and will consist of steel lattice work. The Vickers' design is furnished with a revolving head, to which the airship will be closely moored, bow on, and float clear of the ground. The vessel will thus swing to the direction of the wind, protection from which is provided by the stream-line shape of the body.

A winch and cable will bring the airship to the tower head and an elevator inside the tower will carry crew, passengers, fuel, cargo, etc., to the vessel. At the top of the tower a small compartment serves as an anteroom to the airship, which will be connected to it by a flexible enclosed gangway.

When an airship is making for the tower, it will announce its intention by wireless, and an ingenious system has been devised for bringing it safely to its landing place. The automatic mechanism for releasing the vessel from the tower will be controlled by one man, and not more than three men altogether will be required to bring a dirigible to port and send it out again.

The American Chamber in London understands that a number of these towers are expected to be ready shortly and British airdromes will be immediately supplied with them. A further point of considerable interest to the public is the reported intention to build mooring mast waiting rooms at the foot of the tower which might be easily developed into hotels.

CHANGE FIRM TITLE

MILWAUKEE, March 19—The Mechanical Equipment Co., Milwaukee, has changed its name to Milwaukee Press & Machine Co. and increased the capital stock from \$50,000 to \$65,000. It was established six months ago by expert toolmakers formerly with large automotive concerns and is engaged in manufacturing punch presses and other machine tools, as well as mechanical appliances. A new plant will be erected and equipped during the spring and summer. Adam Siska is president; Theodore Zetterlund, vice-president, and Griffith K. Johnstone, secretary and treasurer.

N.A.C.C. Seeks Data on Timber Supplies Will Endeavor to Locate New Sources With View to Lessening Costs

NEW YORK, March 20—To insure continued supplies of proper wood for the automobile industry, the National Automobile Chamber of Commerce has interested the Forestry Service of the United States Department of Agriculture to the extent of making investigations and endeavoring to get reliable facts and figures.

Last fall questionnaires were sent out to the trade asking about the kind of wood and the amount used in wheels, bodies, floor boards, seat boxes, running boards and bows; just how the wood was bought, dried and used. A second letter has been sent to bring the matter up to date and it is hoped that at a meeting to be held in Washington soon with the various associations representing wood users including the N. A. C. C. the matter can be discussed in detail.

Many industries in the United States, which, at the present time depend upon hardwood lumber or hard wood in other forms as a part of their raw material are experiencing a great deal of difficulty in securing the needed supplies. This is true particularly in the furniture industry, the automobile industry, the railroads and the vehicle manufacturing. It is also true of the general public in its demand for building and construction.

Rapidly increasing prices have, during the past two years, accompanied the growing shortage of hard wood timber. Hard wood lumber prices, during the past year, have increased from 200 to 300 per cent. On practically no grade has the increase been less than 200 per cent. On quartered white oak, for example, mill prices have increased from \$97 to more than \$300 per thousand.

Veneer Industry Cuts into Supply

The growth of the automobile industry has been so rapid and changes in requirements have been so frequent and radical that little data is available on its requirements as to amount. The species most in demand are those which are also in great demand by other industries. The veneer industry used almost half a million feet of material in the form of logs and flitches in 1911 and it is believed that the requirements have greatly increased since that time. Nearly 90 per cent of the total requirements are for hard wood.

One of the first steps toward making adequate provision for the future, says the National Automobile Chamber of Commerce, must be to ascertain what our present timber supplies are, how much young timber there is and how fast it is growing, what the requirements of our various industries and our general public are in quantity and quality, and to formulate plans so far as the forest land available will allow for a production of hard wood timber sufficient to meet our demands.

Royal Air Force Gets \$101,000,000

Civil Aviation to Get \$4,500,000
and \$2,500,000 for Inventors' Rewards

NEW YORK, March 23—The Royal Air Force of Great Britain will have a force of 29,730 men and the total expenditures will be £21,056,930—roughly \$101,000,000 at the normal rate of exchange—for the fiscal year 1920-21, according to information reaching here today from London. These estimates, which have just been issued in the form of a White Paper, include the sum of £894,540—nominally something less than \$4,500,000, for civil aviation and a further item of £500,000—about \$2,500,000—as “rewards for inventors.”

These estimates, although a heavy reduction from the totals for the present fiscal year, evidence the feeling of necessity in England for a continuation of airplane development. Roughly, the proposed expenditure is one-third of that for the present year and the force of officers and men something like one-fifth of the 1919-20 strength.

The importance of the White Paper is that Great Britain finds it valuable to continue a heavy aviation force because of the continuing necessity for research, experimentation and the building up of commercial routes. The experimental and research activities are given £2,575,540 and the amount for technical stores is placed at £6,172,850. The Air Ministry is allotted a sum of £877,000.

The amount for works, building and land for military service is £3,647,000 while under the same heading for civil aviation is £415,000, of which more than a third will be expended for the development of aerial routes. Two other interesting items are those providing £28,500 for flashing lighthouses and £315,000 for the airship constructional establishment.

OVERLAND ADDS \$25,000,000

TOLEDO, OHIO, March 25—Willys-Overland Co., will increase its capital stock by the issuance of \$25,000,000 of common stock, as per the authorization of stockholders at a special meeting yesterday. With this issue the capital stock will be \$100,000,000 of which \$25,000,000 is common. The issuance of another \$25,000,000 in junior preferred was deferred in view of changed conditions and the interests of the present preferred and common stockholders.

OSHKOSH TRUCK EXPANDS

OSHKOSH, WIS., March 15—Arrangements providing for the expansion of the Oshkosh Motor Truck Co. of Oshkosh, Wis., into one of the leading commercial car producers in the Central West have been completed by the company with the backing of the Oshkosh Association of Commerce.

A site of 35 acres at Twenty-fourth and Oregon streets has been purchased, and work will begin April 1 on the erec-

tion of a factory building, 80 x 300 ft., and an office building, 40 x 60 ft. Room for from ten to fifteen units of similar size is available.

A new corporation with \$125,000 capital has been formed by stockholders and other citizens of Oshkosh to finance the purchase of site and construction and equipment of the factory. The present works will be transferred to the new plant when it is completed about June 15.

Financial News

Avery Tractor & Implement Co., Peoria, Ill., has increased its capital stock from \$3,500,000 to \$15,000,000 distributed in the proportion of \$5,000,000 preferred and \$10,000,000 common.

Manitowoc Plating Works, Inc., Manitowoc, Wis., has increased its capital stock from \$35,000 to \$75,000.

Hanson Motor Co., Atlanta, will increase its capital stock from \$1,000,000 to \$1,500,000.

Rome Wire Co., Rome, N. Y., will increase its capital stock to \$4,000,000 in 7 per cent first preferred and \$5,600,000 common stock, the shares to be of \$100.

J. I. Case Threshing Machine Co.—Gross sales in 1919 totalled \$32,342,653 compared with \$25,162,769 in 1918. After preferred dividends there remained a balance equivalent to 22.3 per cent on the common stock.

Packard Motor Car Co.—Directors declared a quarterly dividend of 2 per cent on the common stock, reducing the rate from 10 per cent to 8 per cent.

Stevens-Duryea—An initial quarterly dividend of 1½ per cent has been declared on the preferred stock.

Mutual Tire & Rubber Co., has declared an initial dividend of 1 per cent, payable April 19 to stock of record March 27.

Rainier Motor Corp., is soon to issue 30,000 additional shares of no par value common stock and \$700,000 of 8 per cent cumulative preferred stock, par \$100, all of which has been purchased by a syndicate headed by John Nickerson, Jr.

B. F. Goodrich Company—Stock Exchange has admitted for dealings 600,000 shares of common stock of no par value in exchange for 600,000 shares at present outstanding of \$100 par value.

The Pennsylvania Rubber Co. will pay the regular quarterly dividend of 1½ per cent on preferred stock and 1½ per cent on common stock March 31 to stockholders of record March 15.

Standard Tire Company—Declared initial quarterly dividend of 1½ per cent on preferred and 1½ per cent on common.

Stutz Motor Company—Announces earnings are running at the rate of about \$2,000,000 annually.

Saxon Motor Car Corporation—President Pfeffer says conservative estimates indicate earnings for 1920 of \$1,000,000.

Harper-Bean Output Grows 25 Per Cent

Total Output in February Is 351
Chassis; 65 More Than
January

LONDON, March 11 (*Special correspondence*)—The Harper Bean February output shows an increase of 25 Bean chassis, 20 Vulcan chassis and 26 Swift chassis, as compared with the January output. The figures are 125 Beans, 180 Vulcans and 46 Swifts, making a total output of 351 chassis, as compared with 286 for January. The policy of this combine in publishing monthly its output is being favorably discussed and may stabilize public confidence which in other directions is less secure because of the combined disappointments as to delivery and unstable prices.

Goodyear Begins Work on Big Plant in Brazil

AKRON, OHIO, March 24—The Goodyear Tire and Rubber Co. has decided to establish a branch factory at Rio de Janeiro, Brazil. Construction of the plant, which already has been begun, will be completed in 1922. The capacity will be about 1000 tires a day and the employees will number about 1000. Classes for the training of the personnel in the Portuguese language will be started soon in Akron, where most of the workers will be recruited.

Miles Sails to Study European Conditions

NEW YORK, March 23—Samuel A. Miles, manager of the New York and Chicago shows, sailed for Europe to-day on the Mauretania to make several investigations for the National Automobile Chamber of Commerce.

Among the matters to which he will give his attention is the “international” association of automotive interests, with which the N. A. C. C. has never thus far affiliated. He will also go into the show situation and ascertain the reasons behind a reported movement in Europe for the discontinuance of the motor shows.

He will visit England, Holland, Belgium and France and will be abroad two months. He will also gather information on pertinent subjects for the American Automobile Association.

DESIGN NEW PISTON RING

DETROIT, March 22—Grundy Manufacturing Corp. of Detroit, manufacturers of Permaseal piston rings, have brought out an oil wiping ring for use in engines giving trouble from over-lubrication. It is the same as the Standard Permaseal ring except that it has a groove machined in it, which wipes off excess oil and returns it to the base of the engine. The Permaseal oil groove ring is now in production.

Car Shortage Cuts**Delivery of Steel**

PITTSBURGH, March 24—Car shortage continues to be one of the dominating factors in the production of steel. Because of the difficulty in finding delivery facilities, many mills have been forced to cut operations, while practically all of them report large accumulations of finished material. With the steel in warehouses it is impossible to meet requests for immediate shipments.

The skies are brightening, however, for the approach of spring will inevitably result in an improvement in traffic conditions. The most serious contingency for the next fortnight is the virtual certainty of floods in many parts of the country with the breaking up of great accumulations of snow and ice.

Once the supply of cars approach something like normal the mills feel they can rapidly cut down the accumulation of unfilled orders which have been pouring in from all parts of the country. The great difficulty in this respect is that many of the railroads actually are short of rolling stock. This can be remedied only by purchases from the equipment companies with another increase in the demand for steel. Few large orders have been placed thus far except for locomotives.

The automotive industry is one of those in the worst plight because of unfilled orders. While some of them have accumulated small reserve stocks nearly all of them are urging immediate shipments to meet increasing demands.

DELAWARE INCORPORATIONS

WILMINGTON, DEL., March 22.—The following corporations have been chartered under the laws of Delaware:

Simms Motor Car Corporation, with a capital of \$2,500,000, to manufacture and sell automobiles and parts. The incorporators are M. A. Bruce, S. E. Dill and T. L. Croteau of Wilmington.

Rubber Corporation of America, with a capital of \$2,000,000, to manufacture, sell and deal in rubber and its products. The incorporators are T. L. Croteau, M. A. Bruce and S. E. Dill, all of Wilmington.

Claude Carburetor Co., Inc., with a capital of \$500,000, to manufacture and sell carburetors. The incorporators are Samuel F. Howard, Harry C. Hand and Robert K. Thistle, all of New York.

Millman Motor Corporation, with a capital of \$400,000, to manufacture and sell automobiles. The incorporators are T. L. Croteau, M. A. Bruce and S. E. Dill, all of Wilmington.

Craig-Hunt Motor Co. of Wilmington, with a capital of \$3,000,000, to manufacture motors and trucks. The incorporators are F. L. Buehler, George G. Steigler and E. E. Aberle, all of Wilmington.

Safety Auto Light Corporation, with a capital of \$100,000, to manufacture motors, engines, etc. The incorporators are Edwin L. Newcomb of Brooklyn, N. Y., Herbert E. Latter and T. L. Croteau of Wilmington.

**Current News of
Factories****Notes of New Plants—
Old Ones Enlarged****JOHNS-MANVILLE BUILDS**

MILWAUKEE, March 19—The H. W. Johns-Manville Co. has broken ground for its new works at Waukegan, Ill., which will involve a total investment of \$5,000,000, and supplant the present main plant in Wauwatosa, suburb of Milwaukee. The company manufactures a varied line of automotive equipment, asbestos goods, etc.

PAWNEE TIRE BUYS PLANT

CEDAR FALLS, IOWA, March 19—The Pawnee Tire & Rubber Co., which was incorporated at Sioux City recently with a capital stock of \$1,500,000, has purchased a factory building here and expects to start operations during the coming summer. The Pawnee company has been maintaining offices and a salesroom at Waterloo, adjoining Cedar Falls, for several months. The plant purchased includes six acres of land, a four-story factory building and an office building.

BOLLSTROM MAKES FIRST TRUCK

ST. LOUIS, MICH., March 19.—Bollstrom Motors, Inc., sent their first four-wheel drive truck through St. Louis streets Monday. J. B. Dick, factory manager for the company, in an address at a banquet tendered officials in the evening, said production would start immediately.

COVERT GEAR ADDS UNIT

BUFFALO, March 22.—The Covert Gear Co. of Lockport, N. Y., is building a three-story concrete and brick factory building, costing \$270,000. The new building is near the ones already in use. It will be devoted to the making of gears and will increase the capacity of the plant 40 per cent.

WESTINGHOUSE BUILDS

PHILADELPHIA, March 19 — The Westinghouse Electric & Manufacturing Co. has contracted for the erection of four new buildings at South Philadelphia, Pa. The extension is intended to take care of the immediate needs incidental to the removal of the machine works, formerly the Westinghouse Machine Co. of East Pittsburgh, Pa. Nearly all of the machinery will be transferred from the machine works at East Pittsburgh and will be directly driven by motor.

MUTUAL MOTORS MOVES

NORTH TONAWANDA, N. Y., March 20—The Mutual Motors Co., maker of the Marion-Handley car, has moved from Jackson to North Tonawanda.

**World Markets Open
for American Cars**

NEW YORK, March 24—Trade conditions throughout the world, except where they are dominated by the unfavorable exchange rate, are becoming increasingly favorable for the American manufacturer, according to authoritative information gathered by the Guaranty Trust Company.

In the British Isles galvanized sheets are scarce and increasing stringency is reported in the pig iron situation. In the general iron and steel industry there seems no possibility of overtaking the demand for years to come.

The long and disastrous drought in the Union of South Africa has been broken and motor vehicles are in great demand. Iron foundries are reported to be in a satisfactory position, and trade experts advise the erection of blast furnaces on a modern scale.

France is in the market for American motor cars, trucks, tractors, motorcycles and automobile parts.

There is a great demand in Greece for tractors and motors of from 10 to 200 hp.

The commerce of Chile is showing steady improvement. An aerial transport service has been established between Santiago and Valparaiso by a Franco-Chilean company, which will make three trips a day. A passenger motor car service to and from labor centers also has been opened.

Trade between the United States and Ecuador will be facilitated soon by the opening of regular sailings between New York and Guayaquil by 2000 ton boats of the Blue Diamond line. The government proposes to establish an aviation school and would consider an offer of machines accompanied by instructors.

With the gradual development of good roads, motor cars are becoming increasingly popular among the native officials and prosperous merchants of China.

WISCONSIN TOOL CHANGES

MILWAUKEE, March 19—The controlling interest in the Wisconsin Tool & Supply Co., Milwaukee, has been acquired by Harry E. Jacobs, Edward J. Walzer and William H. Lawton, who will continue the business as manufacturers of machinery, mechanical appliances, etc.

NEW TOOL COMPANY FORMED

KENOSHA, WIS., March 19—The Holm Mfg. Co. has been organized at Kenosha, Wis., with a capital stock of \$50,000 to manufacture tools, jigs, dies, patterns and special machinery for metalworking. A plant is being equipped and will be ready to commence production about April 15. Officers are: President, J. H. Holm; secretary, H. A. Bowman; general manager, W. C. Holm.

PLAN NEW BATTERY PLANT

PHILADELPHIA, March 19 — The Electric Storage Battery Co. is planning the erection of a \$5,000,000 plant on the forty-acre tract at Rising Sun Lane and Adams Avenue.

Municipal Bus Lines Opposed in New York

NEW YORK, March 24—Injunction proceedings have been instituted in the State Supreme court by a taxpayer to restrain the municipal government from operating bus lines in any of the five boroughs. The litigation is stamped by Mayor Hylan as a move by "the traction interests" to choke off competition.

This is the second step in court proceedings to test the validity of the bus business fostered by the city. The first was directed by Federal Judge Mayer under whose direction the receiverships of the New York Railways Company and the Brooklyn Rapid Transit Company are being conducted. He has ordered that suits be started to determine the legality of privately owned lines operating in the streets in opposition to street cars. The buses now in use, excepting those of the Fifth Avenue Coach Company, are running without franchise or the sanction of the Public Service Commission.

Meanwhile the Board of Estimate has authorized the issuance of \$1,140,000 in tax notes for the construction of 200 motor buses to be operated by the city. Plans prepared for the buses by Grover A. Whalen, commissioner of plant and structures, call for vehicles seating thirty persons with standing room for as many more. Seats are to be 24 in. wide.

The steps leading to the interior will be of the collapsible type and will be operated by the chauffeur. Six of the seats will face forward and a semi-circle of seats in the center will accommodate ten passengers.

PICK ELECTS OFFICERS

WEST BEND, WIS., March 22—The Carl Pick Co. of West Bend, Wis., a new \$75,000 corporation organized to manufacture universal joints and other automotive parts, has elected the following officers: President, Carl Pick; vice-president, S. F. Mayer; secretary and treasurer, Carl B. Rix; directors, J. F. Huber and A. J. Langenbach. A plant is being prepared to begin production about May 1.

WHITMAN-BARNES ELECTS

AKRON, OHIO, March 22—Officers of the Whitman & Barnes Manufacturing Co. elected at the recent annual meeting are: A. D. Armitage, president; W. H. Eager, A. B. Hall, and W. J. Elliott, vice-presidents; E. A. Fisher, treasurer; W. E. Rowell, secretary, and S. H. Tuttle, assistant secretary. Elliott formerly was manager of the St. Catharines factory. He will now have charge of the entire Canadian division.

MEREDITH JOINS SAXON

DETROIT, March 19.—H. P. Meredith, formerly in charge of plant extension for the Cadillac Motor Car Co., has been made manufacturing manager of Saxon Motor Car Co. He was instrumental in bringing about the abandonment of the present Cadillac plant for the new one under construction.

Men of the Industry Changes in Personnel and Position

Paul E. Ryan has been appointed manager of the Perfection Spring Co. division of the Standard Parts Co., to succeed J. B. Childe, resigned.

I. B. Meers has been appointed western salesmanager of the Lewis-Hall Motor Corp. His headquarters will be in San Francisco.

Charles E. Wellman has joined the staff of the motor truck department of the Franklin Automobile Co., as designing draftsman.

C. H. La France, of the sales department of the Franklin Automobile Co., has been appointed general manager of the Franklin Products, Inc.

Joseph M. Lake has been appointed general salesmanager of the Sanford Motor Truck Co., Syracuse, N. Y., and C. F. Doty, special representative.

H. H. Hardy, manager of the American Railway Express Co., in Lansing, will have charge of the purchasing department in the high speed limited truck division of the Duplex Truck Co.

C. Martin Kolbenstetter, sales manager and director of the Kol-Ben Wheel Co., and Otis C. Curry, factory superintendent, have severed connections with the company.

E. B. Knowles, for the past fifteen years associated with the brake lining business, recently has become secretary and general manager of the Staybestos Manufacturing Co.

E. F. Paepper, formerly chief engineer of the Republic Motor Truck Co. and the All-American Truck Co., is now chief engineer of the Superior Motor Truck Co. of Atlanta.

W. E. Finkbeiner, consulting engineer, has been engaged by the Production Engineering Co. of 212 Center street, New York.

A. C. Rice, sales manager of the Cycle-motor Corp., Rochester, N. Y., has been appointed vice-president in charge of sales.

Charles A. Tucker has been appointed general sales manager of the Olds Motor Works and will immediately assume the duties of his new position. He succeeds P. L. Emerson, resigned.

S. K. Miller has been promoted to the position of vice-president of the Kentucky Wagon Manufacturing Co. He will retain his place as the head of the sales organization.

H. H. Biggert has been made a vice-president of the Emerson-Brantingham Co., and will have charge of production in the eight E-B factories.

John W. Clerke has joined the engineering staff of Brewster & Co., Long Island City.

N. I. & V. A. Approves Standard Belt Speeds

CHICAGO, March 24—Belt speeds of 1500, 2600, 3000, 3250 and 3500 feet per minute, which previously had been adopted by several departments of the National Implement and Vehicle Association, have been approved by the executive committee of the association. These speeds are now being voted upon by the American Society of Agricultural Engineers. Inasmuch as these speeds have been recommended by the agricultural equipment standards committee, formal approval by the A. S. A. E. will result in the acceptance of these speeds as standards for the industry.

The executive committee also has approved the recommendations of the tractor and thresher department of the N. I. & V. A. for standard tractor and plow hitches which likewise have been approved by the agricultural equipment standards committee and referred to the various organizations represented on this committee for their acceptance as an agricultural equipment standard. These hitches are:

Vertical hitch, 13 in. to 18 in.

Lateral adjustment, 2-bottom tractor, maximum, 28 in.

Lateral adjustment, 3-bottom tractor, maximum, 32 in.

Lateral adjustment, 4-bottom tractor, maximum, 40 in.

They should be so designed that lateral adjustment on a 2-bottom plow will fall within the distance of 28 in. from the furrow wall; on a 3-bottom plow, 32 in., and on a 4-bottom plow, 40 in.

In approving these hitches the executive committee took the position:

"That in the passage of this standard it is understood that where the wheel of the tractor runs in the furrow that the height must be greater than where the wheel runs on the unplowed land and where said wheel does run in the furrow that the latitude of 13 in. to 18 in. is to be measured from the surface of the unplowed land to the drawbar.

"The large latitude in vertical hitch from 13 in. to 18 in. is also made necessary by the difference in size and weight between the smaller 2- and 3-bottom plows and those of 4 bottoms or larger. Therefore the hitch can be higher for such rigs and afford a greater road clearance."

PACKARD GRADS GET WATCHES

DETROIT, March 19.—Packard Motor Car Co., has graduated 281 members of the "class of 1919." Each of the members of the class, all of whom have seen ten years service in the Packard employ, was presented with a gold watch by president Alvin Macauley. A vaudeville entertainment and an address by H. H. Vandenberg, editor of the *Grand Rapids Herald*, featured the presentation exercises.

GOES WITH ARMORCORP

MORGANTOWN, W. VA., March 19—The Armormord Rubber Co. has secured the services of Cody Resseger, of the Mill Rubber Co., Akron, Ohio.

Calendar

SHOWS

April 21-28—San Francisco. National Aeronautic Exposition. Exposition Auditorium.

Oct. 6-16—New York. Electrical Show. Grand Central Palace. George F. Parker, Manager.

FOREIGN SHOWS

April 3-May 4—Buenos Aires. Exposition of U. S. manufacturers.

May 15-June 13—Cars, Parts and Accessories. Antwerp.

June 26-July 25—Commercial vehicles, tractors, camions and engines. Antwerp.

July 9-20—London, England. International Aircraft Exhibition. Olympia. The Society of British Aircraft Constructors.

Aug. 7-Sept. 15—Motorcycles, sidecars, etc. Antwerp.

October—London. Commercial Vehicle Show. Olympia.

November—London. Passenger Car Show. Olympia.

CONTESTS

May 1—Hanford, Cal. Dirt track.

May 31—Indianapolis, Ind. Speedway.

May 31—Brockport, N. Y. Dirt track.

June 1—Omaha, Neb. Truck Reliability Run.

June 12—Uniontown, Pa. Speedway.

June 17—Portland, Ore. Dirt track.

June 19—Ogdensburg, N. Y. Dirt track.

July 4—Tacoma, Wash. Speedway.

July 4—Hanford, Cal. Dirt track.

July 4—Spokane, Wash. Dirt track.

July 5—Batavia, N. Y. Dirt track.

July 17—Warren, Pa. Dirt track.

July 24—Watertown, N. Y. Dirt track.

July 31—Fulton, N. Y. Dirt track.

Aug. 7—Erie, Pa. Dirt track.

Aug. 14—Buffalo, N. Y. Dirt track.

Aug. 21—Johnstown City, Pa. Dirt track.

Aug. 28—Canandaigua, N. Y. Dirt track.

Aug. 20-21—Middletown, N. Y. Dirt track.

Aug. 27-8—Flemington, N. J. Dirt track.

August, 1920—Paris, France. Grand Prix Race. Sporting Commission Automobile Club of France.

Sept. 1—Glidden Tour—N. Y. to San Francisco.

Sept. 6—Hornell, N. Y. Dirt track.

Sept. 6—Cincinnati, O. Speedway.

Sept. 6—Uniontown, Pa. Speedway.

Sept. 17-18—Syracuse, N. Y. Dirt track.

Sept. 25—Allentown, Pa. Dirt track.

Oct. 1-2—Trenton, N. J. Dirt track.

Oct. 8-9—Danbury, Conn. Dirt track.

CONVENTIONS

April 27-29—Atlantic City. Increased Production Convention, Chamber of Commerce of the United States.

May 9-12—Independent American Petroleum Congress, Congress Hotel, Chicago.

May 12-15, 1920—San Francisco. Seventh National Foreign Trade Convention.

June 22-25—Asbury Park, N. J. Annual meeting American Society for Testing Materials.

S. A. E. MEETINGS

April 7—Minneapolis Section Meeting. Subject—Tractor Weight and Drawbar Pulls.

April 8—Metropolitan Section, Automobile Club of America, New York. Subject—A Study of Tire Deflection and Unsprung Weight in Trucks. Speaker, A. F. Masury. Illustrated.

LaFayette to Build Homes for Employees

INDIANAPOLIS, March 24—Development of an independent community adjacent to its plant at Mars Hill, four and a half miles from the center of the city, has been begun by the LaFayette Motors Company. A homes building company has been incorporated with a capitalization of \$1,000,000 and already has started the construction of 200 modern dwellings to assist in housing the skilled labor required in the production of the new LaFayette car.

There already is a small community in the vicinity of the plant, but the new development is designed to care for the rapid increase in population which is inevitable. A wooded ridge of 110 acres five blocks from the factory has been selected as the residential center of Mars Hill. No two of the new houses will be exactly alike. They will be served by a business district with stores, bank, hotel, garage and motion picture theater. A modern grade school will be erected and a large park and playground are other community advantages proposed.

The houses will be sold to LaFayette employees at cost with a payment down and monthly installments which range from \$20 to \$75. Buildings of a special fireproof concrete type will be favored. Each house will have sewer connections, furnace, electric lights and gas.

SASKATCHEWAN CARS GAIN

WASHINGTON, March 19—Saskatchewan has more motor vehicles than any other Canadian province, according to a recent commerce report.

During 1919 there were 58,811 licenses issued, as compared to 50,671 in 1918. Licenses for private automobiles numbered 54,801; auto livery, 1584; dealers' cars, 944; chauffeurs, 852; garage cars, 190, and motorcycles 450. There was a decrease of 135 in the number of motorcycles as compared with 1918.

La France to Build Trucks in New Plant

ELMIRA, N. Y., March 19.—The American La France Fire Engine Co., builders of fire department apparatus, is completing its first series of motor trucks in its plant at Elmira. These types include the following sizes: 5, 3½, 2½ and 1½ tons.

The company has acquired a tract of more than 23 acres in Bloomfield, N. J., near Newark, on which a plant is being erected. Operation is expected to begin there this summer. The company has branch salesrooms and service stations in Boston, New York, Philadelphia, Atlanta, Pittsburgh, Dallas, Chicago, Minneapolis, Denver, San Francisco, Los Angeles, Portland, Ore., and Toronto, Canada. It is proposed to carry a full stock of commercial truck parts.

PAIGE PRICES INCREASE

DETROIT, March 19.—Following are new prices of Paige models which became effective March 9:

6-42 Glenbrook five-passenger touring, \$1,770; 6-42 light six coupe, \$2,495; 6-42 five-passenger sedan, \$2,595; 6-55 Essex five-passenger touring, \$2,400; 6-55 Larchmont, \$2,500; 6-55 five-passenger coupe, \$2,260; 6-55 seven-passenger sedan, \$3,360.

Accessory Association Seeks New Members

A nation-wide campaign to increase the membership of the Motor and Accessory Manufacturers' Association has just been launched.

More than 300 representative manufacturers of parts and accessories for the automotive industries are now members of the association and it is hoped to add to this group a large percentage of the eligible companies who are not yet affiliated.

"The association," says M. L. Heminway, general manager, in his announcement, "has behind it a sixteen year record of constructive achievements for the good of the entire industry. Within the last year or so its scope has been enlarged and its services and advantages multiplied to the point where we believe it practically essential for every forward-looking manufacturer in the industry to become affiliated."

RELiance WHEEL TO BUILD

YOUNGSTOWN, March 19.—The Reliance Wheel Co., manufacturer of pressed steel double disk wheels, has adopted an extensive program providing for greatly increased production on the erection of a new plant on thirty acres recently acquired here, the first unit of which will be under construction within a short time.

To meet this extension the stockholders, at a recent meeting, voted to increase the capital stock to 25,000 shares, no par value, common stock, \$500,000, at 8 per cent cumulative preferred.

AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

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No. 14

The Need for Standardization of Hub Designs

With large losses to equipment makers, car manufacturers and owners resulting from the present multiplicity of such designs, Mr. Schipper appeals here for more simplicity in the production of hub parts. He has made a thorough study of the field and his statements are made with a force of authority.

By J. Edward Schipper

MILLIONS of dollars are being wasted annually because of the lack of hub standardization. This applies to both the passenger car and truck fields. Wheel and axle manufacturers are suffering alike from this situation and, although there have been one or two attempts to standardize axles, with a view toward limiting the number of wheel mountings and hub designs, nothing has resulted. This matter affects not only the manufacturer but also the user of cars, as it is a serious expense for each. At the present time, when there is a growing tendency on the part of owners to ask for wire or disk wheel equipment, the situation is becoming almost impossible.

It is true that practically every difficulty which one could think of is in the way of standardizing this part of the chassis but, nevertheless, there are good reasons to believe that the force of opinion of both wheel and axle manufacturers is sufficient to carry this matter through, should an earnest effort be put into it. If it was possible during the war to bring manufacturers together on a common ground on problems far more difficult than this, it should be possible now to obtain that co-operation which will work to the benefit of the entire industry.

It is only necessary to consider for a moment the

difficulties confronting a manufacturer in the wire or disk wheel business. In the passenger car field he has perhaps a hundred types of axles requiring a hundred different hub designs, for which he must make manufacturing provisions. He must secure dies, jigs and fixtures and tool his plant to turn out varying quantities of each type. Until he has gone through this entire list and put himself in a position to manufacture each of these hubs, he is not in a position to supply wheels for every make of car. Automobile manufacturers have repeatedly been turned down by makers of disk and wire wheels who were unable to turn out the particular type of hub for that particular car, because they simply had not got to the point where they could take care of its manufacture.

It has been argued by some that there is no possibility of making any consistent standard unless the simple type of live axle is used universally. That is the type employed by such concerns as Pierce-Arrow, Packard, Hudson, Jordan, Studebaker, Peerless, Premier, Ford, etc. This viewpoint no doubt is correct in a measure, as it would be impossible for any committee to set itself up as opposed to designs made by representative axle manufacturers who do not use that particular type.

Even allowing for the fact that at least for several years we are going to have full, semi- and three-quarter floating axles, it is possible to reduce the number of hub designs in use. One of the peculiar features of the situation is that some of the small, low-priced cars require much more expensive and bulky hub equipment than do the axles used on the more expensive cars, and this regardless of the type of wheel used.

Three Axle Types to Remain

It would be premature at this time to attempt to get axle manufacturers together on a decision of what is the best all-around design as regards the full, semi- or three-quarter floating types, and for all manufacturers to decide in future to work along that design. Some day this happy situation may materialize, but from the present viewpoint it looks almost as remote as the time when "the lion and the lamb shall lie down together."

While the situation has been realized by all concerned for a long time, there has been no real effort put behind it, largely because of the realization of the difficulties confronted every time a committee holds a meeting. Nevertheless, it is recognized that axle manufacturers could do wonders toward helping wheel manufacturers, if they could get together. Axles could be standardized, at least as to the length and diameter of the spindles in the different classes such as the semi, three-quarter and full floating.

A concrete example of what the wheel maker has to contend with may be given. In one particular car, one of the lowest priced on the American market, it is almost impossible to build a satisfactory wire wheel

because the rear spindle is so much shorter than the front that to get a tracking tread it is necessary to make a great overlap on the rear. This situation leads to the breakage of the axle shaft or chewing out of the bearings on the rear. This type of axle works satisfactorily with wood wheels, but since many users of the car demand wire wheel equipment, it seems quite reasonable that the axle manufacturer might lengthen the spindle to make it satisfactory to the wire wheel maker.

It is not too much to state that the engineering problem put up to a wheel manufacturer is one of the most vexatious now before the industry, and as one wheel man puts it, "At times we almost think that every axle engineer is trying to make the problem more difficult, instead of trying to simplify matters."

This situation, although bad, is no worse than what confronted us during the war. The memories of the attempts of the manufacturers themselves to standardize tire sizes are still fresh in our minds. One of the things really accomplished during the war was the reduction of tire sizes. This was done by a definite action of the War Industries Board to the great benefit of the entire industry, in spite of all the claims of impossibility that were advanced.

Sacrifices Necessary

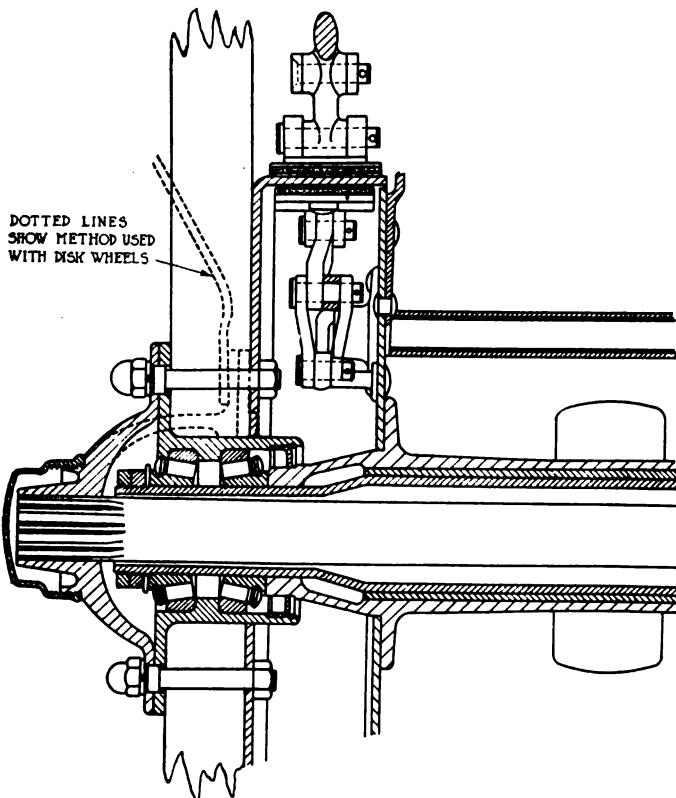
To accomplish the desired result it will be necessary that some sacrifices be made by axle manufacturers but, nevertheless, in the long run it will result to the benefit of not only these makers but to the industry in general. It cannot be denied that a greater interchangeability of parts for service and repair shops, a smaller die cost because of the fewer dies required by forging concerns and reduced cost and increased convenience to the car manufacturer would be bound to result.

With demand as it is at the present time and with no real competition in the field, the opportunity is here for manufacturers to overcome the reluctance of the past to changing their axle layouts and the tool equipment for producing them. Full cognizance of the difficulties has been taken by the writer and, in fact, by all who have made any kind of a study of the problem, but the more it is studied the more forcibly one is brought to the conclusion that now is the time to push this movement.

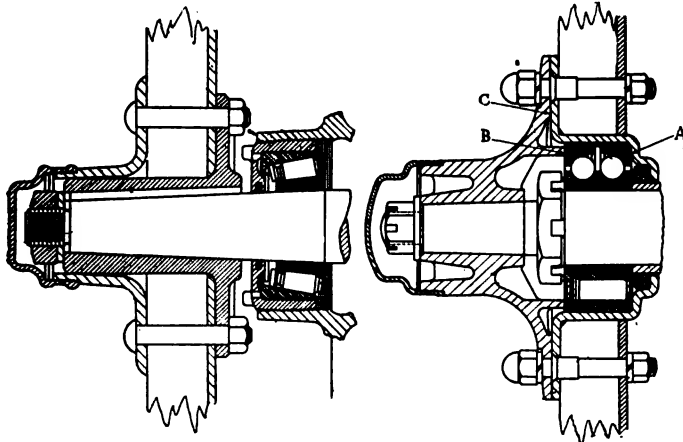
The disk wheel industry is in its infancy. There is a standing demand for wire wheels on the part of certain users, and there is no reason why the wood wheel manufacturer should be compelled to take into consideration the great variety of hub designs now confronting him.

While this sounds as if it were going to entail considerable loss to axle manufacturers they, too, will gain in the end. It will be possible for them to concentrate their entire facilities on a smaller variety of hubs, reducing the cost of production and tending toward reduction of the price of car manufacture. That, in turn, means increased production. The jobber and the dealer would be able to carry in stock a far smaller assortment of parts, some of which now have but little call and represent only dead capital on the shelf.

Axle manufacturers are not particularly interested in standard designs of hubs for wire and disk wheels. Nevertheless, they are interested in bringing about a standardization on wood and steel wheel hub designs. Taking the passenger car field, the axle maker supplies the hubs for the wood wheels, as a rule, and the customers of the axle



A floating axle of a common and simple design. The dotted lines show how the hub must be redesigned for one type of disk wheel



Left—A type of hub that presents little or no difficulty to the wheel manufacturer, and which lends itself readily to standardization

Right—A difficult type of hub, from the wheel manufacturer's standpoint. Note points A, B and C, which must be highly accurate to prevent bearing slip

manufacturer who use wire or disk wheels provide for the hubs themselves. In other words, they secure the hubs from the wheel factory. It would be an exceptionally heavy expense for the axle maker to carry in stock hub patterns for all the different makes of wire and disk wheels. If standardization were secured it would make it possible for the axle factory to furnish wire or disk wheel hubs without such an expense.

There is not an axle manufacturer who has not had considerable difficulty in trying to adapt standard wood wheel hubs to various designs of steel wheels. This standardization could be carried to cover the hub barrel diameter, the hub bolt circle, and the size and number of hub bolts.

Certainly standardization of the hubs would be in the direction of simplicity. From a manufacturing standpoint, that is always desirable; and, if it is possible to develop the simplest type of hub for each of the three types of axles, that is, the full, semi- and three-quarter floating, and, if necessary, three series for light, medium and heavy weight cars, a big step would have been taken. That would lead to a minimum of nine standard hub designs, with a possibility of ten or twelve, a big reduction from the present number, in the neighborhood of one hundred for passenger cars alone. Nevertheless, it is not much more of an undertaking to do this than it has been to standardize certain other features.

When a situation is found like the one cited above, where it is much more expensive and complicated to manufacture a hub for a low priced car than one for a high priced machine, there is certainly reason enough for manufacturers to take vigorous steps toward remedying it. Machinery for the creation of these standards is already in existence. There are committees representing the Wood Wheel Manufacturers' Association, the Metal Wheel Manufacturers' Association and the Society of Automotive Engineers. Co-operation between these bodies has been pledged and some preliminary meetings have been held. These committees have before them a work presenting exceptional difficulties because it will be necessary in the creation of these standards to make important modifications in the design of certain axle types.

In the long run, however, it will be a benefit rather than a detriment to the axle manufacturers affected, because the changes will be in the direction of simplicity and will tend to make big reductions in production costs. The matter must be regarded frankly and with an open mind. It is evident that if it is possible to manufacture a hub

for the Cadillac, Pierce-Arrow or Packard cars, which are known for their standards of engineering but have reasonably simple designs with low manufacturing costs, it is feasible to use similar practice in producing axles for lower priced cars rather than to utilize some form of design that gives no better performance and in which the manufacturing costs run from 200 to 300 per cent higher.

It is, of course, a rather embarrassing situation for an engineer to go to the executives of his concern and state that the axle would have to be redesigned to meet the standards requirements and then to find that he is getting lower priced manufacture and better performance. Yet in some cases this might readily occur. But when it is considered that the lack of standardization in these parts is causing the loss of millions to the industry, personal pride should be laid aside.

Capital Tied Up in Tools

If it is necessary for a wheel factory to be equipped to produce eighty different kinds of hubs and if it costs, on an average, \$2,000 per hub to tool for production, it is apparent that a needless amount of capital becomes tied up in tools, jigs and fixtures before an ounce of material is bought or a machine started. The result is that car manufacturers who want wire wheels or disk wheels on a portion of their production cannot secure them unless they happen to be one of those who are using an axle for which the wheel maker is in a position to supply the hub.

This analysis of the situation is made largely from the passenger car standpoint, but it applies just as forcibly to truck wheel manufacture. Now that we have a greater diversity of wheel types than ever before, and with production growing, we should not delay much longer in standardizing this part. A canvass of the field of the manufacturers interested indicates unanimous opinion that the movement should be carried on at once, and, where there is so much will, there should certainly be a way.

If we grant that the passenger car field must have three basic types of axles, the floating, semi-floating and three-quarter floating, and that each should have three series, a light, heavy and medium, this would make nine designs as a minimum. Even with twelve, or double that number, we would have accomplished a tremendous good.

An International Council for Scientific Research

THE report of the conference held in Brussels last summer at which the constitution of an International Research Council was finally agreed upon has been completed and will be published in a few weeks' time. It was agreed that the convention should come into force on Jan. 1 last, provided that at least three of the following countries should have signified their adhesion: Belgium, Brazil, the United States, France, the United Kingdom, Australia, Canada, New Zealand, South Africa, Greece, Italy, Japan, Poland, Portugal, Rumania, and Serbia. The requisite number of acceptances have been received.

The purpose of the council is to co-ordinate international efforts in science and its applications; to initiate the formation of international associations or unions deemed to be useful to the progress of science; to direct international scientific activity in subjects outside the purview of existing international associations; and to enter into relation with the governments of the adhering countries in order to promote investigations. The legal domicile of the council will be at Brussels where the general assemblies will be held and the archives kept. Donations and legacies will be received and administered according to Belgian law.

Makers of Six Nations Show Tractors at Paris

Several new European machines are described in this article, which reveals that France will have need of some 25,000 tractors in the next ten years. French production and various changes in design are discussed, and estimates made of the probable output of several European factories.

PARIS, March 12.

FRANCE seems to be afraid of tractor competitions, for this year, instead of her spring tractor trials, she has merely organized an exhibition in the Tuileries Gardens, in the center of Paris. The event is under the control of the French Syndicate of Tractor Manufacturers. As an exhibition it is good, for the location is excellent, and, having been well advertised, visitors are numerous.

The claim is made by many, however, that competitions and not exhibitions are required. Farmers should be given figures and not adjectives. Last autumn England had real trials at Lincoln from which officially checked figures were available for the benefit of farmers. In France there never has been a tractor competition in which it was possible for one machine to show up to better advantage than another. Dissatisfied with the exhibition only, the importers of foreign tractors decided to hold demonstrations at the same time, and for this purpose secured a farm to the west of Paris, where all the foreign machines could be seen at work. The French makers were obliged to follow this example, but instead of uniting, each worked on his own initiative. While all the foreigners can be seen at work on one day, it is necessary to spend a day for each of the French machines carrying out demonstrations on scattered farms.

The exhibitors represent six nations, as follows: France, England, America, Italy, Switzerland, and the Czechoslovak Republic. The French makers are Renault, Tourand-Latit, Somua, Delahaye, Doizy, Peugeot, Atlas, Dubois, De Dion-Bouton, Chapron, Bauche, Filtz, René Pétard, Scemia, and Douilhet. The greater number and the more important of these are automobile manufacturers.

Italy has two machines on exhibition, the Fiat and the Pavesi. Switzerland has sent the Berna tractor, built by the leading Swiss truck maker. The Czechoslovak machine comes from the Laurin-Klement automobile factory at Prague. Austin is the only representative from England. Many of the American machines are presented under French names, and there appears to be a tendency to pass them off as French productions. The lot comprises Fordson, Happy Farmer, McCormack, Moline, Gray, Case, Hart-Parr, Mogul, Titan, Avery, Whitney and Sandusky. Several American machines took part in the demonstrations, but were not on exhibition in Paris.

According to a statement made by the president of the French Syndicate of Tractor Manufacturers, French requirements are 25,000 tractors to be delivered within a period of ten years. The claim is made that the French industry is now in a position to meet all requirements. This is not borne out by facts, for no French makers can guarantee immediate deliveries and not one has yet fully developed his program. Renault, who is the biggest

maker, expects to reach an output of 100 per month very shortly. At the present moment Renault is behind on deliveries and the situation is made worse by inability to get freight cars for delivering finished machines.

There are two makers of track-laying machines in France, Renault and Peugeot. The former machine is a modification of the tank which Renault built in very large numbers during the last year of the war. All the armor plating has been removed; the motor, instead of being at the rear, has been placed forward, but except that the creeper bands are narrower, there is practically no difference between the Renault tank and the Renault tractor.

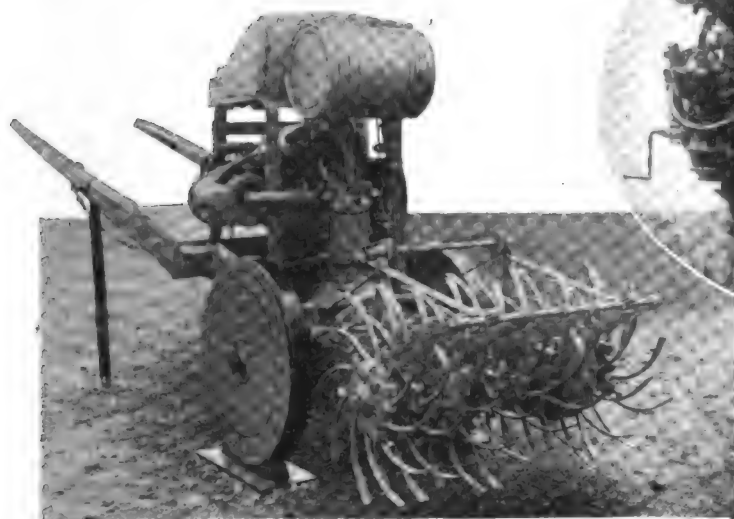
After a year's experience on the land, Renault has found it possible to make improvements in his tractor. The first of the new machines was on exhibition; deliveries will be made in July. Practically no change has been made in the engine, which is a four-cylinder, 30-hp. type, practically identical with the one used on the Renault 3-ton truck. Instead of four speeds and reverse, only three are now fitted. All plowing is done on second, or direct drive, and road work on the third indirect gear. The main clutch is still a leather-faced cone type. The two lateral clutches, which originally were cone-type lined with Ferodo, are now multiple disk, and are contained in the same housing as the main reducing gears. This is the first time in more than 20 years that Renault has used a disk clutch.

After the first gear reduction by means of spur pinions, there is a second reduction by means of planetaries inside the two main driving pinions. This is the same type of reducing gear as that used within the road wheels of the Renault 7-ton truck. Changes have been made in the frame, which is attached to the tracks by a couple of inverted transverse semi-elliptic springs. The endless bands have been increased in width to 13¼ in. All the rollers within the bands have been modified in order to protect them against dirt, and the grease cups have a diameter of 3 in. The drawbar is placed below the axle, in order to overcome the tendency of the machine to "rear" under certain circumstances, and the main sprockets driving the bands never come in contact with the ground. Total weight of the machine has been reduced to 3 tons. As the result of these changes all working parts are fully protected against dirt and the rollers of the endless bands are made easy to lubricate. It is claimed that mechanical efficiency has been increased 15 per cent.

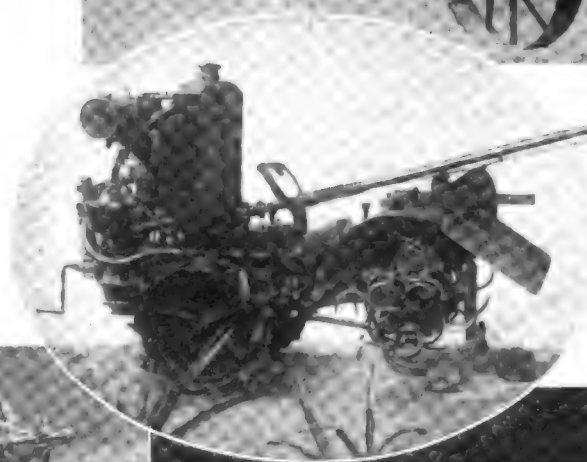
Peugeot appears to have made no change in his tractor, but has brought out a new plow and a new tow hook. The Tourand-Latit self-contained tractor plow remains unchanged, as does the Delahaye. De Dion-Bouton exhibits two types of cable plowing machines. They are both four-wheel machines, of respectively 30 and 50 hp., with the winding drum mounted centrally and on a longi-

New European Equip- ment at the Paris Tractor Show

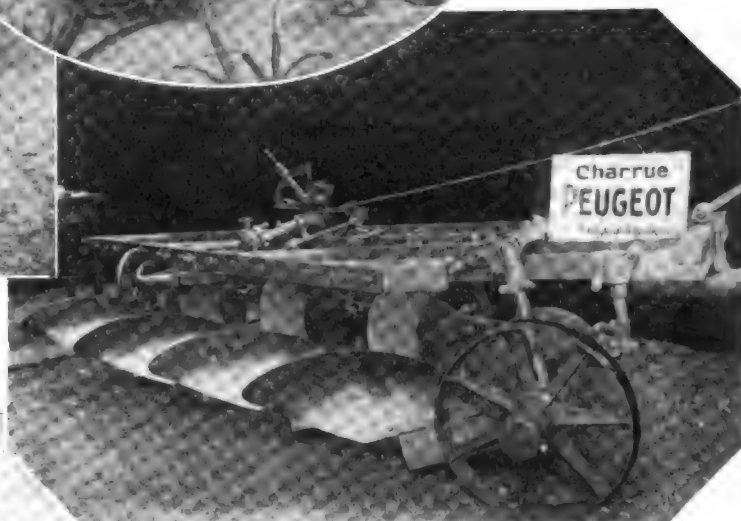
*To the right—The Berna tractor is a
Swiss product*



*Above—The Petard horse-drawn rotary
cultivator. The wheels are a one-piece
steel stamping*



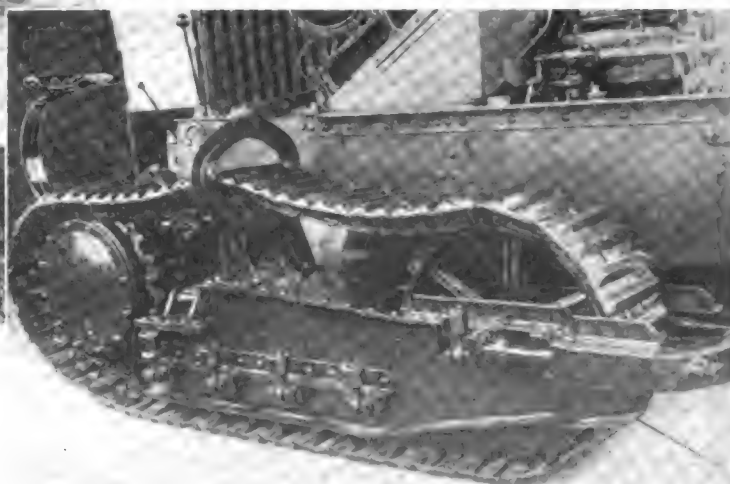
*The small
Somua rotary
cultivator
for vineyards*



Above—The Peugeot plow



*Above—Rear view of the Renault tractor,
showing clutch housing and reducing
gears*



*Right—The endless bands of the Renault
tractor. Planetary reducing gears
are contained in the driving sprocket*

tudinal shaft. Another cable machine is the Doizy, which is also a four-wheeler with central anchorage, and winding drum mounted on a transverse shaft just ahead of the rear axle.

French makers are paying a lot of attention to the narrow track machine for work in vineyards and on small farms. Citroen is just about to produce a machine of this type, but has not yet got it on the market. Another newcomer is the Scemia, an organization connected with the Paris General Omnibus Co. For more than a year this firm has been building the English Saunderson tractor. Its latest production is a narrow-track machine with a total width of 40 in., with driving wheels of 41 in. and steerers of 27-in. diameter. The frame, which is rectangular, carrying in front a two-cylinder, 4 x 6 in. engine, with clutch, gearbox, jackshaft and internal gear drive to the rear wheels, has a trunnion attachment to the center of the front axle, and is suspended by a quarter elliptic spring from the axle to the frame.

René Pétard, formerly engineer to the Mitchell and Lewis companies in America, has brought out a horse-drawn, narrow-track, rotary cultivator for vineyards and plantations. The power plant is a single cylinder, valve-in-head engine, which drives a cross shaft at the rear by

means of enclosed chains; the shaft is telescopic, so that the chains work independently. The rotary cultivator is mounted on the shaft or can be replaced by a pulley for driving farm machinery.

The Swiss Berna bears all the marks of the truck manufacturer. It has a 4.4 x 6.3 in., four-cylinder, truck motor, a cone clutch, three-speed gearbox and internal gear drive to the 63-in. driving wheels. The front end is suspended by a transverse spring. The propeller shaft is extended back of the axle and has a 10-in. belt pulley mounted on it. In addition there is a capstan on the rear platform designed specially for forestry work.

Italy's leading contribution is the Fiat tractor, which has taken part in all Continental competitions of the last few months. No changes have been made in its design. The Pavesi machine, built in Milan, is a new type from an old established firm.

The Excelsior, which is the only Czechoslovak contribution, also bears the imprint of the truck manufacturer, for its makers are the Laurin-Klement Automobile Co. The engine is a standard automobile type, 3.9 x 5.9 in., with internal gear drive to the two front wheels. The rear wheel, tracking with the left-hand driver, is the steering wheel.

Record Flight of the L-59

ONE of the most creditable aviation performances during the war was the flight of the Zeppelin L-59 from Bulgaria to Central Africa and back without stop. Not much detailed information about the feat got abroad at the time, but a member of the crew, Hans Schedelmann, recently contributed an article on the flight to the *Illustrierte Motor-Zeitung* of Munich, from which the following is taken.

The task set the L-59 was to carry a 20-ton cargo of hospital supplies, medicines and munitions to the hard-pressed German colonial army of Lettow-Vorbeck. On Nov. 21, 1917, the flight started from Jamboli, Bulgaria, the headquarters of the Zeppelin, at 8:35 o'clock in the morning. At 6:00 p.m. Smyrna was passed, during the night the Mediterranean was crossed, and at 5:15 o'clock the next morning the African shore was reached at Ras Bulau. At 12:30 p.m. the Farafrah Oasis was passed and at 3:15 o'clock the Dachel Oasis. On Nov. 23, at 2:50 a.m., in the neighborhood of Khartoum, the crew received a wireless order from Nauen, Germany, to "Turn about, East Africa occupied." When this order was received, much more than half the distance had been covered.

The return journey also was completed without incident. Assisted by favorable air currents, the cruiser re-passed the Farafrah Oasis at 8 p.m. the same night and at dawn the next morning was over the Mediterranean. But enormous temperature variations had to be borne up with. While, on the afternoon of Nov. 23, at an altitude of 8000 ft., a temperature of 79 deg. Fahr. was observed and the crew was sitting at the engines in tropical garments, ten hour later, when the thermometers registered 14 deg. Fahr., fur vests and leather coats did good service. On Nov. 24, at 2:20 p.m., the town of Adalia in Asia Minor was passed. In order to cross the Taurus Mountains, it was necessary to sacrifice some barrels of gasoline. In spite of some rather violent mountain squalls, the airship passed Ishickli at 5 o'clock and Simao at 7:20, and at 11 o'clock at night Constantinople was passed. On Nov. 25, at 8 a.m., the L-59 returned to its landing-place, after a continuous flight of 96 hr., carrying supplies for 80 hr.

additional flight. A distance of 4550 miles was covered without stop, which constitutes a record.

Money Is Not the Sole End of Man

THOSE production executives who are prone to believe that money is the only thing affecting the attitude of the workman toward his work will be interested in the following incident which occurred recently in a large Detroit automobile plant.

A certain workman was earning about \$8 a day grinding piston pins. Because of a shortage of stock, there were no piston pins to be ground for a time and he was shifted to the task of grinding distributor rods. The average production of a good man grinding distributor rods in that plant is about 175 a day. This man, though new on the job, turned out nearly 300 a day, which netted him a little over \$14. Since it is the policy of this plant never to cut piece rates, he was assured that he could continue to earn that money, although, in the general opinion of the shop, the job is preferable to that of grinding piston pins in other ways.

Strangely enough, however, the foreman has had the greatest difficulty in keeping him at work on distributor rods until the stock for his piston pin work shall come in. He would rather lay off for the time being and then go back to his \$8 a day, grinding piston pins. The foreman has been unable to discover the reason for his apparently strange desire.

The incident is strange, to be sure, but it is entirely true. Such incidents, though comparatively unimportant in themselves, are practical indications of the fact that many things other than money considerations enter into the attitude of the workman toward his work and his company. As in this case, too it is often difficult to determine the real factors behind such an attitude. In general, they cannot be determined without recognition and a careful investigation. The results of such an investigation would be significant and valuable.

Unit Construction of New Tractor Facilitates Production

Partly assembled and partly of special design, the 3-plow machine of the Magnet company has a worm drive and an unusual type of tangential spoked wheel. Numerous features of its mechanical interest are detailed by Mr. Heldt, who has just completed a trip to numerous tractor factories.

By P. M. Heldt

A 3-PLOW tractor with worm drive and a special type of tangential spoked wheel will be the product of the recently organized Magnet Tractor Co. The machine is partly assembled and partly of special design, the engine being Waukesha and the clutch Borg & Beck, while the transmissions and axles are specially designed and will be manufactured by the concern itself.

The machine is made in three separate units, each assembled by itself, the first comprising the engine or power plant with the clutch, the second the transmission gear and belt pulley drive, which are complete in a single case, and the third comprising the rear axle with its worm drive. The units are independently mounted on a channel steel frame, and any one may be removed without disturbing the others. Flexible couplings are used to connect the engine to the transmission and the transmission to the final drive, these couplings being of a special design. The rear coupling or universal joint has the brake drum incorporated with it. Among the advantages claimed for the unit construction are that it facilitates production in the factory, thus reducing the cost, that it enables the farmer to make repairs or replacements without difficulty and that it permits of using different grades of lubricant in the transmission and rear axle from that used in the engine.

The engine is the Model DU, which has $4\frac{1}{2} \times 6\frac{1}{4}$ in. cylinders, and operates normally at 900 r.p.m. A centrifugal governor of the throttling type is built in with the engine and lubrication is by the circulating splash system.

The radiator is of the truck type with cast-iron tanks and side members. The water capacity of the cooling system is 9 gal. The fuel tank is mounted under the engine hood and has a capacity of 20 gal. of kerosene and 5 gal. of gasoline. A Stromberg combination kerosene and gasoline carbureter is fitted, which draws in air through a Bennett air cleaner. Ignition is by a Berling high tension magneto with impulse starter.

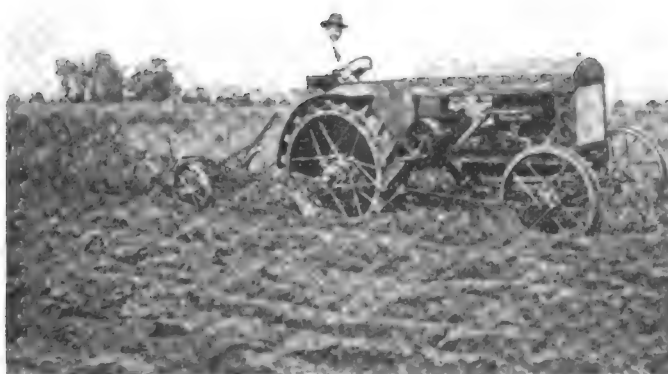
A Borg & Beck heavy type dry disk clutch is used and is enclosed in a housing on the crankcase. This clutch is normally engaged and may be disengaged by means of a

pedal. The transmission is of Magnet design, and three forward speeds and one reverse are available, none of these being a direct drive. The primary shaft of the transmission, which is in line with the crankshaft, is located in the bottom of the transmission housing and the secondary shaft above it. All of the pinions on the primary shaft are fastened upon it, and gear changes are effected by sliding the gears on the splined secondary shaft. Of the four pinions on the primary shaft, the most forward one is the high speed, the second the intermediate, the third the low and the fourth the reverse. The gear on the secondary shaft corresponding to the high

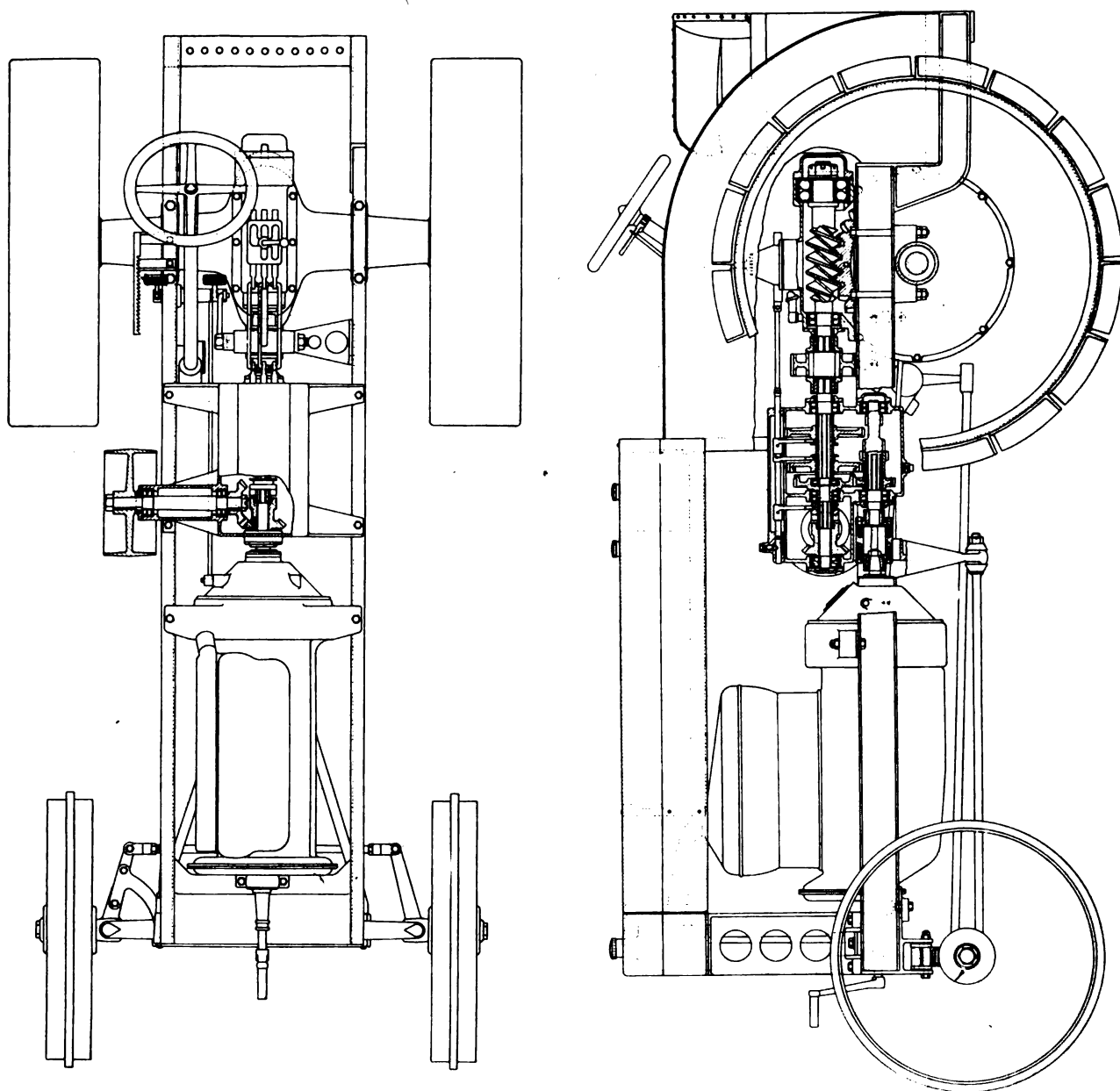
speed is loose upon this shaft, but can be made fast upon it by sliding the intermediary gear forward. This gear is of larger diameter than the high speed gear and is cut with teeth on the inside of its rim, which permits it to be slipped over a portion of the high-speed gear and thus locks the latter to the shaft. For the intermediate speed, the gear corresponding to that speed is slid into mesh with its pinion on the primary shaft, while another gear on the secondary shaft can be slid into mesh either with a low-speed pinion or

the reverse idler gear. With an engine speed of 900 r.p.m. the different tractor speeds are as follows: high, 5 m.p.h.; intermediate, 2.55 m.p.h.; low, 1.8, m.p.h.; reverse, 1.4 m.p.h. All bearings of the transmission, as well as the axle bearings, are of the anti-friction type.

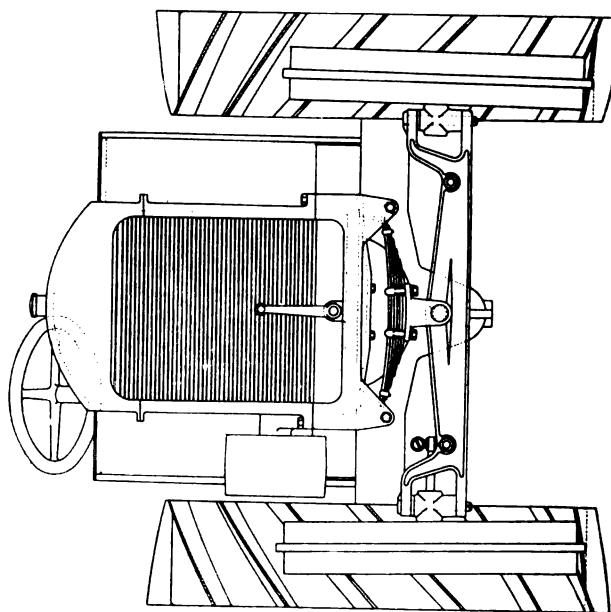
A noteworthy feature of the transmission is the design of the power take-off. It will be seen from the drawings that the belt pulley is located in an accessible position on the right-hand side, sufficiently high to insure belt clearance over the front axle and sufficiently far ahead to obviate interference of the rear wheel with manipulation of the belt. This favorable pulley position is secured, however, at the expense of a double gear transmission of the belt power. Upon a forward extension of the secondary shaft is mounted a bevel gear, running normally free upon the shaft, but provided with one member of a jaw clutch, by means of which it can be locked to the shaft. This bevel gear meshes with a similar one on the power take-off shaft. Belt power is transmitted through the high speed set of gears in the transmission and through the



Magnet tractor plowing



Three Assembly Views of
Magnet Tractor, with Trans-
mission and Drive Shown
in Section



bevel gears of the power take-off. Engagement and disengagement of the jaw clutch for the power take-off is effected by means of the gear-shifting lever. The pulley has a diameter of 14 in. x 7 in. face, and runs at 700 r.p.m. when the motor is turning over at 900 r.p.m. The belt speed therefore figures out to 2600 ft. per min.

Final drive is by worm and worm wheel, the latter being 22 in. in diameter and made of aluminum bronze. The worm shaft and the differential are mounted on annular ball bearings, while Hyatt roller bearings are fitted at the outer ends of the axle. A band brake is fitted to act on the drum mounted on the worm shaft; it is actuated by a pedal and is provided with a ratchet locking device. The rear wheels are 48 in. in diameter and have a 12-in. face, the hub being cast with two series of radial lugs instead of flanges, heavy round iron spokes extending through these lugs tangentially and being riveted to the wheel rims. This makes a construction particularly well adapted to take care of the torsional forces set up by the drive. The front wheels are of similar construction and are 34 in. in diameter by 6-in. face. They are provided with ball bearings and dust-proof hub caps.

Steering is effected by means of a worm-and-gear type steering gear completely enclosed and working in a bath of oil. In plowing, the inner wheels run in the furrow

and the tractor is said to be self-steering. A comfortable operator's seat with padded back rest is mounted at the right side on the rear platform. All control levers are within easy reach, and the driver from his seat has a clear view of the front wheel and the furrow ahead. Plow levers may be operated from the seat or platform.

The front axle is of I section and the forward end of the frame is carried upon it through a semi-elliptic spring, which is swiveled to the axle at the center and shackled at its ends to spring brackets cast integral with the front cross member of the frame. A wishbone type of radius rod connects the front axle to a cross member of the frame and, together with the swivel connection of axle and spring, permits great flexibility.

The frame is of channel steel, hot riveted and well braced. The tractor has a wheelbase of 90 in. and the following overall dimensions: height, 62 in.; width, 68 in.; length, 142 in. The drawbar hitch is located at a height of 17 in. from the ground and is so arranged transversely that center draft is provided with three 14-in. bottoms, when running in the furrow with the inner wheels. Adjustment of the hitch both laterally and up and down can be made for other requirements. A ground clearance of 14 in. is provided. The weight of the complete tractor is only 4400 lb.

A New Positive Fuel Feed Utilizes a Pulsater Device

A POSITIVE fuel feed by a pulsater system is being offered as an equipment proposition by the Stromberg Carburetor Co. The system operates by pressure which, however, is not applied to the tank, but simply to the line between the fuel pump and the carburetor. The layout of the system will be understood from the diagrammatic drawing herewith, which shows the pulsater, driven by the camshaft of the engine. The pulsater is connected by a copper tube T with the fuel pump and this fuel pump communicates with the fuel tank and the carburetor.

Pressure and suction are exerted alternately by the pulsater and, on the suction stroke, a vacuum is created in the chamber A, which is in communication with the fuel tank, allowing fuel to enter this chamber and rise through the strainer to the upper compartment B, containing the float C. Suction on the chamber B allows the

light valve D to rise, admitting the fuel to the chamber. The lift of this valve is from 0.010 to 0.015 in. As the fuel rises it lifts the float C, eventually shutting the pulsater line through contact of the valve V with the valve seat. The pressure stroke of the pulsater depresses the valve E, sending the fuel through the orifices F, and thence to the carburetor through the opening G.

For cleaning or inspection, the entire fuel pump is readily disassembled and the strainer can be removed by taking off the cap H. In the installation of the device, the carburetor should be located above the fuel pump outlet. Sufficient pressure is exerted on this outlet to raise the fuel to a considerable head and also to replace that used by the engine readily, regardless of the speed. Another necessary point in the installation of the system is that the fuel tank is vented to obtain a flow to the pump on the suction stroke of the pulsater.

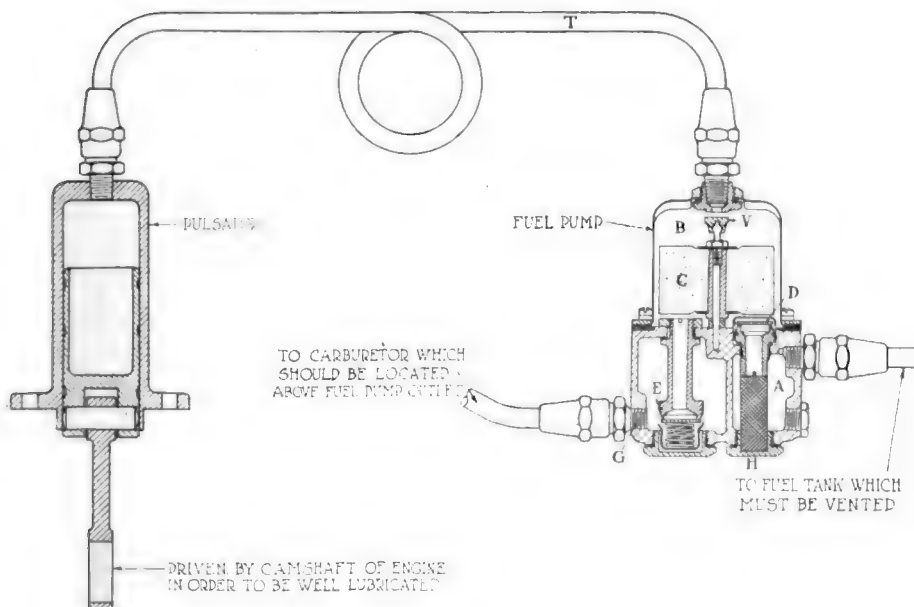


Fig. 1—Installation drawing of the Stromberg fuel system

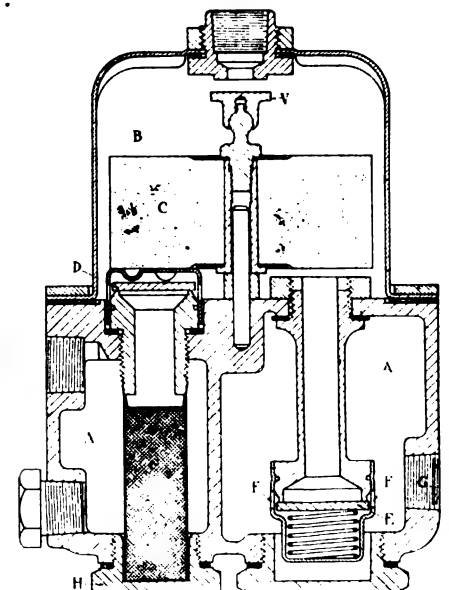


Fig. 2—Sectional view through the Stromberg fuel pump

Preserving the Automobile Finish

At first thought this article might be presumed to belong to the garage. But it really is a manufacturers' problem. A review of several of the instruction books given to car purchasers reveals that not a single one of those looked into gives proper directions for the care of the body finish. One advised the use of "pure soap." Perhaps a neutral soap was meant, but pure soap may be judged from many standards.

By W. H. and E. J. Cole

MUCH thought and experimentation is being devoted at the present time to preserving the automobile finish. This finish is subjected to very severe treatment: Quick changes of temperature on passing from a heated garage to the freezing outside, standing in the snow and rain for hours at a time, mud spattered on the surface and dried on, standing in the broiling sun of a hot summer's day.

As to the finish, most manufacturers give the bodies of their cars several coats of enamel and varnish, brushed or sprayed on, and usually air-dried. Fenders and other metal trim are dipped in tanks of black baking japan, and then baked in ovens at temperatures running from 300° to 450° F. The time required for baking varies from 2½ hours at the lower temperature to ½ hour at the higher. This baking process produces a finish, tougher and more durable than can be produced by air-drying.

Drying of a varnish or enamel proceeds principally by oxidation. This action is rapid until the film becomes hard. It does not stop here, however, but proceeds very slowly throughout the life of the film. In the case of black baking japans, owing to the temperature of baking and materials used in manufacture, namely gilsonite, pitch and certain gums, the drying process is one of polymerization rather than oxidation. With this film there is almost no further oxidation as compared with the other type.

For some time we have thought the methods now in use for cleaning automobiles were very destructive to the finish. The most common method of cleaning is to wash with soap and water, and to dry with chamois. In many public garages, soap containing free alkali is used, which is very bad. Washing every day, also, is more than any finish can stand for long. The man who takes care of his own car, frequently doesn't care to go to the trouble of washing with soap and water, as it is a nasty job at best. He cleans off his car with one of the polishes recommended for automobile use. These may be divided into two classes: (1) The oil polish which consists of an emulsion of mineral oil and water, and usually containing a little soap and alcohol. (2) The wax polish, similar in appearance to ordinary shoe polish, and consisting usually of blends of paraffin and Canäuba wax, thinned to consistency for use with turpentine.

In order to determine the effect on the life of the finish of using these various methods of cleaning, we have made a test extending over a period of six months.

For test pieces, secured six steel plates, 18 in. x 8 in., washed them off thoroughly with benzine, and brushed

on both sides and all edges one coat of Fender Black Enamel, as put out by Hilo Varnish Corp. This is an elastic, air-drying black enamel, which sets dust-free in four hours and dries hard overnight. These plates were allowed to dry three days, after which they were rubbed lightly with pumice stone and water. Then three plates were brushed with one coat of Hilo Quick Finishing Varnish, which we will call A. The other three were finished similarly with Hilo Body Finishing Varnish, which we will call B.

After drying seven days, these were exposed on the roof. Once each week these panels were cleaned and inspected. 1-A and 1-B were washed simply with water and neutral soap; 2-A and 2-B were dusted off and polished with one of the regular automobile oil polishes, as put out for the automobile trade; 3-A and 3-B were dusted, and polished with a popular automobile wax polish.

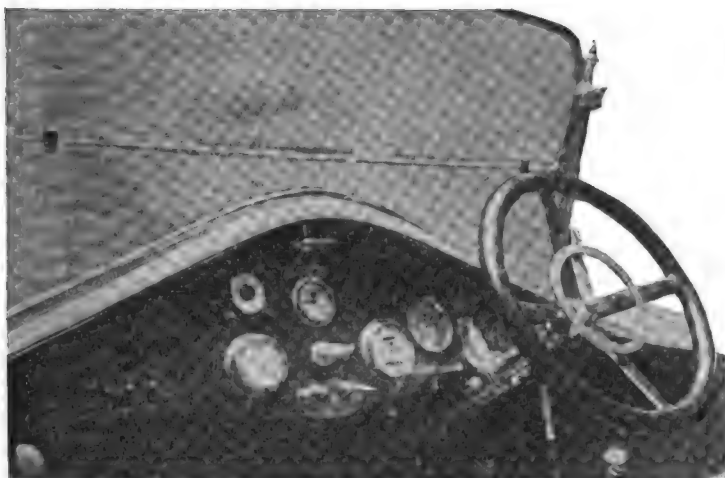
For the first four months very little change in the durability of the finish could be seen. Immediately after cleaning, panels 2-A and 2-B, treated with the oil polish, had the best appearance, but in 24 hours, owing to the fact that they had gathered more dust, they didn't look as good as the others. Panels 3-A and 3-B, treated with the wax polish, were second best in appearance, although they were slightly spotted from raindrops. The wax alone would not remove these. Panels 1-A and 1-B were not as bright after cleaning as would be expected. Although a few marks showed where they had been rubbed, the finish was O. K.

Five months' weathering showed some striking changes. Panels 1-A and 1-B had the best appearance. Panels 3-A and 3-B, although slightly spotted and mottled, were better looking than 2-A and 2-B, both of which showed many fine cracks.

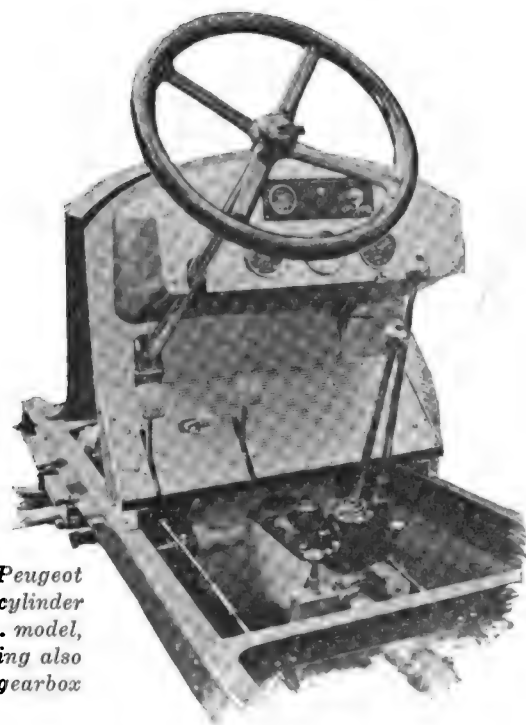
After six months' exposure, panels 1-A and 1-B showed up decidedly the best. The luster was good and the finish showed no cracks. Panels 2-A and 2-B had cracked worse and worse until they were a mass of fine cracks, which gave them a flat, dull appearance. 3-A and 3-B showed many fine cracks, but did not show up as bad as 2-A and 2-B. In every case the results secured with one varnish paralleled those secured with the other.

From these tests we conclude that washing with soap and water is the best method of cleaning. It has been claimed that the use of oil and wax polishes lengthened the life of the finish, owing to the thin film of oil and wax left on the surface. This film is supposed to retard and prevent oxidation of the varnish beneath. This theory is completely exploded.

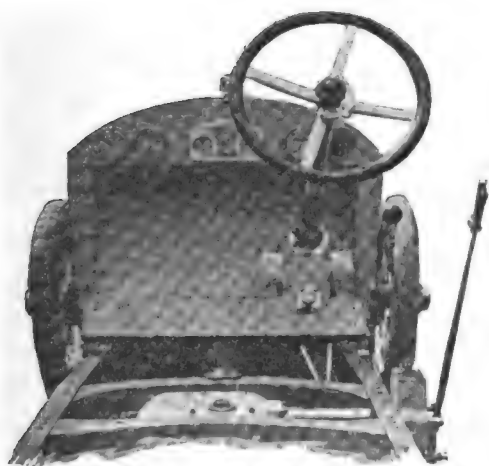
A Study of Continental Dashboards



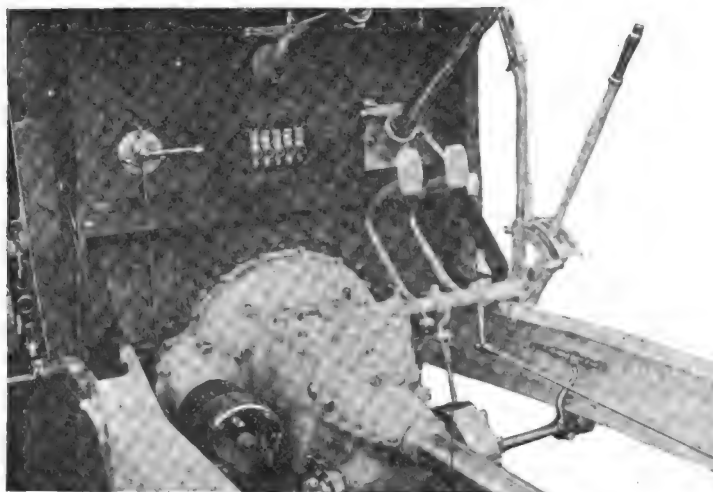
The well-filled dashboard of the new Picard-Pictet



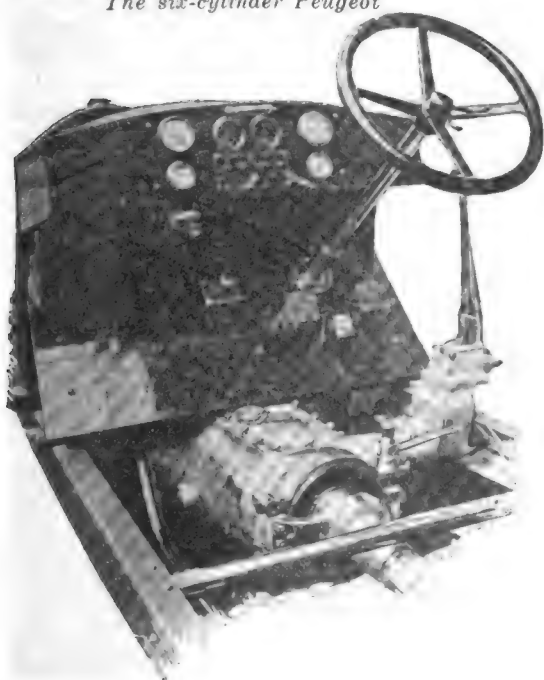
*The Peugeot
four-cylinder
10-hp. model,
showing also
the gearbox*



The six-cylinder Peugeot

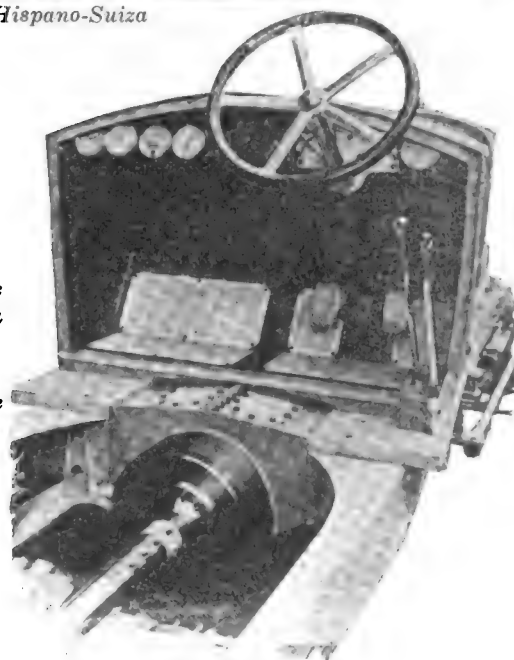


The Hispano-Suiza



*To the left—The gearbox
and dashboard of the Spa*

*To the right—The Gnome
& Rhone*



The Cause of Static Phenomena on Ignition Cables

How the ground or return circuit, if close and parallel to an active cable, traps the stray lines of force that otherwise would affect the neighboring cables. Theory and practice in guarding against static troubles.

By Harry F. Geist, E. E.

IT is well known in ignition practice that the high voltage impulse of electrical energy which initiates the spark at one of the spark plugs, will under certain conditions leave an electrical charge called "static" clinging to the circuit after the spark proper has been delivered, or it may cause a transfer of energy to other neighboring circuits by induction. The electrostatic effect may arise in multi-cylinder engine ignition installations where the cables used parallel each other for a considerable length and it may be sufficient to seriously interfere with ignition, unless special precautions are taken.

The purpose of this article is to discuss briefly the general nature of electrostatic phenomena, in order to bring out the underlying principle of the grounded metal tube which is now very generally used to protect the cables both mechanically and electrically.

Let us first consider the high tension ignition system and the electrical impulses to which it is subjected during operation, touching only upon those phases affecting static phenomena.

In Fig. 1 is shown diagrammatically a high tension magneto ignition system distributing to four spark plugs. This diagram shows the primary winding, condenser and breaker, each grounded to the armature core representing the primary or generating circuit. The secondary circuit also starts from the armature core and feeds to an insulated collector spool and thence to the distributor, which makes the proper connections with the spark plugs through four insulated cables. The secondary ground or return circuit includes the engine and magneto frame and in addition a grounded tube which carries the cables.

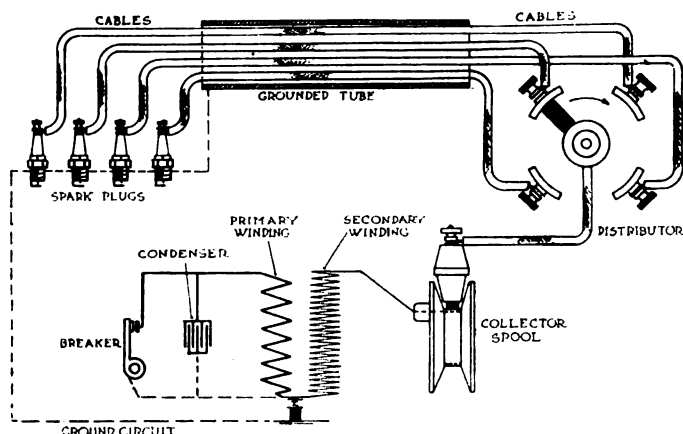


Fig. 1—Circuit diagram for high-tension magneto ignition system with 4-cylinder engine

From the figure it is seen that the distributor can only connect one spark plug circuit directly with the magneto at any one time. Also, that the other three cables are open circuited both at the spark plug and the distributor and are so paralleled to the "acting" cable that if their parallel lengths are sufficient in any case, induction, as hereafter described, may take place to such a degree that trouble will result. Other secondary circuit conditions will be pointed out in the course of the discussion.

Fig. 2 shows graphically the impulses of electrical potential to which the secondary circuit is subject during sparking. The sequence of events is indicated by the arrow.

During the period when the breaker is closed, generating and storing the energy for the spark, the potential generated in the secondary circuit is negligibly small, so that the instant of interruption of the primary circuit is taken as the logical starting point. Following this instant, a very high potential is set up in the open secondary circuit, almost instantaneously reaching a value sufficient to cause an arc-over at the spark plug and starting the spark. As the spark current starts to flow across the spark gap the potential, of course, drops off to what is shown as the spark voltage, the variations being due to oscillations of electric energy between the primary winding and the condenser. After from 0.003 to 0.005 second, the energy becomes spent in the spark to such a degree that the spark current suddenly ceases and induces the voltage peak indicated by "discontinuation of spark," after which the voltage drops off to nearly zero.

Following the cessation of the spark, the primary breaker again comes to a close, short circuiting the primary winding. But inasmuch as it closes under the action of a spring, its closing is usually characterized by a few vibrations, each of which interrupts an incipient

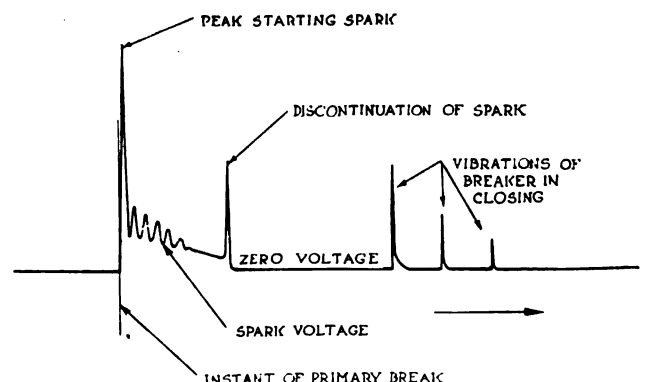


Fig. 2—Voltage impulses in secondary circuit during the sparking phenomena

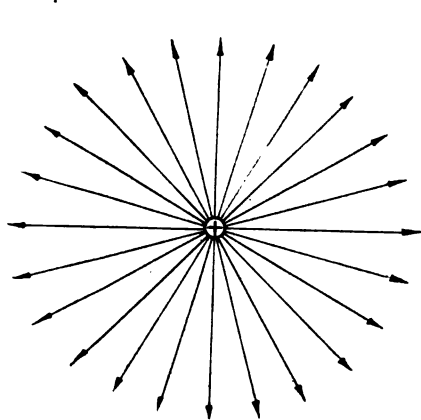


Fig. 3—Electrostatic charge established on isolated cable

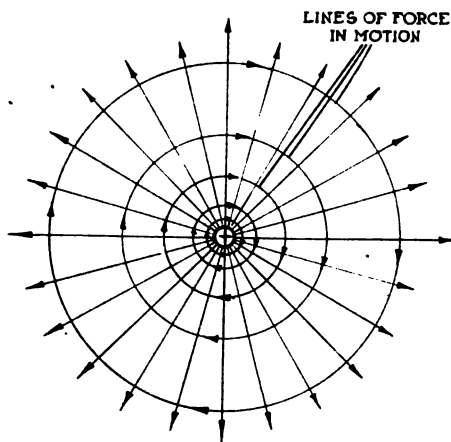


Fig. 4—Process of charging isolated cable during the establishment of high potential

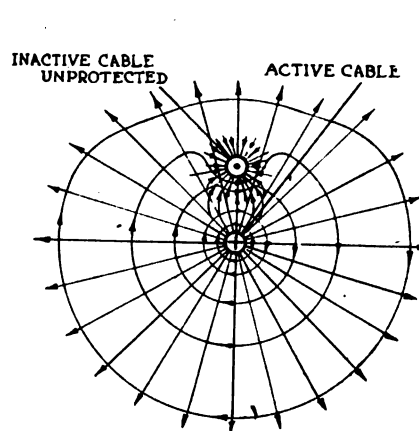


Fig. 5—Charging of neighboring cable by induction during energization of active isolated cable

energy generation in the primary circuit, and consequently produces a series of secondary circuit voltage "kicks."

The principal thing the writer wishes to point out in Fig. 2 is that a series of voltage impulses follows the break of the primary circuit, until it is finally completely closed again. These impulses are usually of the same polarity for any one spark, as shown, and occur over a period of time equal to two or more times the duration of the spark itself.

It is these voltage impulses that give rise to the "static effect" that may cause trouble. But before attempting to analyze the troubles which may arise under certain conditions from the impingement of these impulses upon the secondary circuit or to investigate methods for protecting the circuit, let us first consider the general nature of static electricity.

When a relatively high potential is impressed upon an open circuit, four results follow—namely:

1. The circuit takes on a charge of electro-static energy, due to a certain distributed capacity for this energy which exists between the circuit parts subjected to the potential. This charge will seek parts of the circuit where the capacity is the greatest and will also gather at any sharp ends or points on the circuit.

2. During the very brief period of time required for this charge to become established, induction takes place, energizing neighboring cables which happen to be within range of this rapidly building up charge. Such an electro-static charge in an ignition circuit requires 0.00001 second or less to build up, so that while this form of energy is usually called static it is most certainly dynamic until established.

3. After such a charge has been established, it may cling to the circuit long after the force or voltage which produced it has been removed, unless a leakage path exists.

4. The circuit insulation of the cables, etc., cannot be perfect, and some energy, however slight, will leak.

It is well to point out at this time, inasmuch as both the factors of capacity and insulation are of consequence, that there is no means of insulating against the establishment of an electro-static field any more than it is possible to insulate against magnetism. However, the quality of the insulation and its possible leakage allowance may affect very materially the amount of the electro-static charge that can be established, and determine how long the charge will cling to the circuit after the potential is removed.

Fig. 3 is intended to represent an isolated cable in

which an electro-static charge has been induced. By the term "isolated" is meant a cable so distant from its return circuit, toward which all the lines of force extend, that the field immediately surrounding the cable will be practically uniform. This field extends outward from the cable in every possible direction, just as light would radiate from it.

As was pointed out, this stress may exist with the potential that produced it or may exist upon the cable after the potential is removed. This stress represented diagrammatically in Fig. 3 is a form of stored energy, and as energy it requires time either for its establishment or for its dissipation.

It has been found that such a charge of electro-static energy can be expressed by the equation

$$Q = CE \quad (1)$$

where Q is the quantity of electricity, C , the distributed capacity, and E , the potential required to establish the stress.

It is also well known that Q is the product of current and time, so that equation (1) can be written in the form

$$Q = IT = CE \quad (2)$$

From these equations it is evident that the voltage does not actually exist in a circuit until the charge has been established. Furthermore, it must also be apparent that for a circuit having a non-uniform distribution of capacity, the potential due to the establishment of a charge may mean a much higher potential for one part of the circuit than another.

From the fact that current and time are required to establish an electro-static field we can derive the equation

$$i = C \delta e / \delta t \quad (3)$$

in which i and e represent instantaneous values of current and voltage.

Equation (3) shows that for a circuit in which the voltage builds up over some period of time, the current will at any instant be directly proportional to the amount of the capacity and to the rate of voltage change.

From equation (3) the power represented in the establishment of the field can be expressed by

$$p = ei = CE \delta e / \delta t \quad (4)$$

and the energy represented in the charge by

$$W = C e^2 / 2 \quad (5)$$

This energy equation shows that the amount of energy represented is proportional to the square of the voltage. This means that in the case of two spark plugs being set so that the voltage required to produce a spark at one is twice as much as at the other, the corresponding energy charge necessary will be four times as much.

In order to show how the energy builds up according

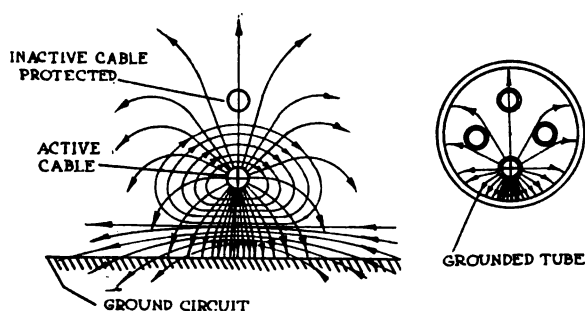


Fig. 6—Proximity of ground circuit distorts field and protects neighboring cable

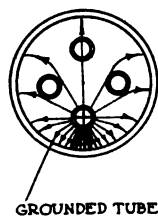


Fig. 7—Cables carried in grounded metal tube, which eliminates inductive effects

to equation (3), diagram Fig. 4 is shown. In this figure the same radial lines shown in Fig. 3 represent the charge already established, while the ring lines of force are set up by the current i and are expanding and moving outward at a very high rate of speed, adding energy to the charge. It is the motion of these lines of force traveling outward at a very high rate of speed that induces charges in neighboring cables.

This phenomenon known as induction is represented in Fig. 5 which shows how the circular lines of force in moving outward have to cut across the neighboring cable, inducing current flow and building up a static charge of opposite polarity from that being established on the acting cable. While these current forces are not as powerful as those accompanying purely electro-magnetic phenomena, induction takes place at greater distances.

Thus it is seen from Fig. 5 that a parallel neighboring cable, while it may have no metallic connection with an active cable, may become energized by induction. The amount of the energization of the neighboring cable will depend upon the amount of the force energizing the acting cable, the rate of energization, the proximity to the acting cable and the distance to which the cables are parallel. This is under the assumption of the "isolation" condition as illustrated in Figs. 3, 4 and 5.

When the ground or return circuit is close to the acting cable, the conditions are changed considerably and may serve as a shield against induction in parallel cables.

This condition is illustrated by Fig. 6. The return circuit for the radial lines of force being now very close to the cable, most of the lines of force will take the shortest possible path and the charge will therefore be concentrated on one side of the cable. The capacity of the cable is also increased so that the amount of charge will be greater.

During the establishment of this distorted field, the circular forces traveling outward are limited in their scope to a distance roughly one-half the distance between the cable and ground. Furthermore, these circular lines of force will be very much reduced in strength on the side opposite the ground, so that a neighboring parallel cable located as the inactive cable as shown in Fig. 6, is shielded from inductive effects. If the neighboring cable was so located that it came between the acting cable and its ground circuit, it would also be in a shielded zone, because the circular forces moving outward from both the acting cable and the ground circuit meet at a neutral plane where induction is practically impossible.

Induction therefore takes place, it is seen, under the conditions where the circular lines of force move outward and cut across neighboring cables at a high rate of speed.

The shielding effect of a distorted field, as caused by the proximity of the ground circuit, is the underlying principle of the grounded metallic tube and explains why

the inductive effects are reduced when such a tube carries the cables.

Fig. 7 shows such a tube carrying four cables and illustrates how the field set up on the acting cable will be most dense on the side nearest the tube, allowing very little of the electro-static energy to act upon the other three cables.

The principal function of the grounded tube from an electrical standpoint is that of shielding the neighboring parallel cables from the inductive effects that would otherwise accompany the energization of the acting cable. The tube, however, cannot eliminate the static charge that may tend to cling to the acting cable after the spark has been delivered, unless it does so by increasing the leakage, in which case it might be as much of a disadvantage as an advantage.

However, the elimination of induction in the case of four parallel cables, for example, reduces the number of electrical charges that any one cable will be subject to, to only twenty-five per cent and that ought to be of considerable aid in the elimination of static trouble.

There seems to be very little data available upon the effects of induction on parallel cables as employed in high tension ignition systems; neither does there seem to be any classification of the troubles which might arise from electro-static charges, either clinging to or induced upon cables, in terms of the conditions permitting them. It has, however, been the writer's experience that these troubles are of an intermittent nature; sometimes they give engine trouble and sometimes not and when they do it is usually of such irregularity that analysis is very difficult. Static electricity is also influenced very much by climatic conditions, the charge leaking away very rapidly where there is dampness. However, the only two engine troubles that can arise from static effects are pre-ignition and misfiring.

In the operation of a high tension magneto ignition system, every other spark in turn is of opposite polarity, so that in case a residue positive charge was left upon a cable after the spark was delivered, it would follow that in the case of conditions permitting considerable induction, the next negative spark would induce a positive charge or series of charges which would add to the original residue charge, perhaps building it up to such an extent that one of the voltage kicks would be sufficient to cause it to jump over at the spark plug. It may require a number of sparks to finally build the static charge to a sufficient value to cause trouble; it may not always jump over at a time when trouble will result, but the fact that such a charge can be accumulated and discharged at almost any time makes it certain that pre-ignition will at times result.

Conditions in the circuit may be such that a negative charge may accumulate upon a cable. When this cable is ready to be energized for the delivery of a positive spark, the negative charge will first have to be neutralized before the positive charge can be established. Under certain conditions, the system may not have sufficient power to perform this double duty in starting the spark, and the result will be that the system will misfire.

Inductive effects usually become of consequence in ignition systems where long cables are used. Long cables should be avoided as much as possible, because their large distributed capacity calls for an electro-static charge at the starting of the spark that may be an excessive burden and sufficient to cause some weaker magnetos or battery systems to fail entirely. In addition, the amount of energy leakage increases in proportion to the cable length, meaning an additional drain on the energy available for the initiation and completion of the spark.

Figs. 8 and 9 show some very simple but interesting

experiments revealing the presence and something of the nature of static effects.

In Fig. 8 is shown a spark plug at which a spark is being produced under atmospheric pressure. The gap is widened about as much as the system will stand. By bringing the metal end of a screwdriver or other tool into the field of the spark, it will be found that the spark can be teased into jumping a greater distance than it normally would. This phenomenon occurs when the conditions of the discharge points are the same in both cases and is due entirely to a static effect.

The metal screwdriver has a certain capacity, and when brought into the field it becomes charged by induction, so that a certain independent potential is set up between the screwdriver and the spark plug. This potential adds to the spark producing potential across the spark plug gap, so that an easier path for the spark can thus be established for the spark by a longer route.

In Fig. 9 the screwdriver is held close to the high potential point of the spark plug but sufficiently distant from ground not to come within the path of the dynamic spark. In this case the screwdriver will again be charged by induction and a static charge will jump over to the screwdriver. This discharge of static electricity relieves the spark plug and cable, and indicates the amount of charge and the potential force it has.

The method of relieving static charges illustrated in Fig. 9 is made use of in what is known as the standard three point test gap, now in general use by magneto manufacturers in their test work. The same principle

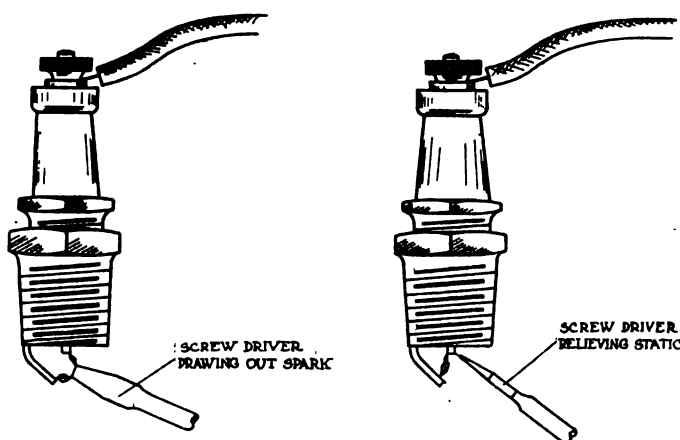


Fig. 8—By drawing out spark, screw-driver shows presence of static electricity

Fig. 9—Screw-driver relieving static condition

might be employed to relieve the static charge on an ignition system while in operation on an engine. Another method of relieving static charges would be a rotating grounding device incorporated in the distributor. This method would no doubt be the most effective.

But the grounded tube, offering as it does a mechanical as well as an electrical protection to cables, being inexpensive and not subject to any wear or other mechanical troubles, has been generally adopted as the standard method for cable protection.

MP, a Factor of Merit of Internal Combustion Engines

THE use of the factor *MP* (mean pressure) as a criterion of merit for internal combustion engines is recommended by Herman Lemp in an article in the *General Electric Review*. This factor has been used by other writers under the name "brake mean effective pressure" and is equal to the mean effective pressure during the power stroke multiplied by the mechanical efficiency. Lemp shows that the value of this factor can be readily determined from the results of brake tests and the cylinder dimensions, speed of rotation and number of cylinders of the engine. For instance, the equation for a multiple cylinder four-stroke cycle engine would be

$$\frac{s \times d^2 \times n \times N \times MP}{1,000,000} = BHP$$

where *s* is the length of stroke in inches

d, the cylinder bore in inches

n, the revolutions per minute

N, the number of pistons.

A similar formula can be used for two-stroke cycle engines, the only change being the addition of the multiplier 2 in the numerator of the fraction, which is due to the fact that for a given speed of revolution there are twice as many power strokes per minute.

Starting with the well-known formula for the brake horsepower of a double acting steam engine

$$\frac{PLAN}{33,000} = HP$$

and, taking into account the fact that in a four-stroke cycle internal combustion engine there is only one power stroke in every four strokes performed by the piston

and the piston is acted upon only on one side, we arrive at the following correct formula for the horsepower:

$$\frac{3.14}{4 \times 12 \times 33,000 \times 2} \times s \times d^2 \times n \times N \times MP$$

which reduces to

$$\frac{1}{1,008,403} \times s \times d^2 \times n \times N \times MP$$

The numerator in the above fraction differs from 1,000,000 by less than 1 per cent and for ordinary purposes it is sufficiently accurate to use the denominator 1,000,000. The equation can then be transformed to read

$$\frac{s \times d^2 \times n \times N}{1,000,000} = \frac{BHP}{MP}$$

Mr. Lemp lays particular stress on the value of *MP* as a characteristic for comparing engines of different design. A high *MP* is an indication that both the indicated horsepower for a given displacement is high and the internal friction is low, hence a large brake horsepower is developed.

For instance, Diesel engines have a very high mean effective pressure, but the mechanical efficiency is low as compared with automobile engines of the constant volume type. For this reason the *MP* of the Diesel engine is only slightly larger than that of an engine of the constant volume type, the value usually being between 70 and 84 lb. per sq. in. Aircraft engines, on the other hand, show an *MP* of 100 to 105 lb. per sq. in., which is due to the combination of high thermal efficiency with a high mechanical efficiency.

The Design and Construction of the 183 cu. in. Engine

Part II

The final instalment of the article begun in the issue of last week; this takes up the commercial use of the 3-liter engine. The writers predict that the overhead valve will become prominent and present the engineering side of this interesting problem, showing its necessary study and problems.

By S. Gerster and W. F. Bradley*

RACING undoubtedly has influenced considerably the development of the 183 cu. in. engine for passenger car service. From 1909 the size of engines has steadily decreased and, at present, in France and England, the average engine size is less than that figure. This, of course, is due in considerable measure to the system of taxation on horsepower and to the high cost of gasoline. The outcome is that in all European countries it is considered possible to get out of an engine not exceeding 183 cu. in. all the power required for a full-sized passenger car. Cars are built with a larger cylindrical capacity, but in such a small minority that they may be classed as luxury machines only.

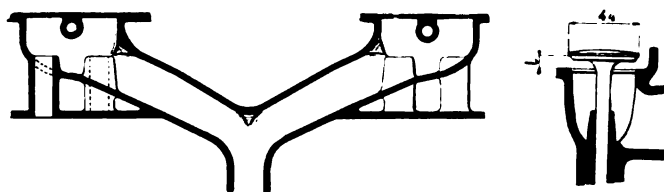
The racing experience with overhead valve engines undoubtedly will make itself felt commercially within a short time. European makers, as a whole, are not ready for the 183 cu. in. overhead valve engine for passenger cars but it appears to be the type of construction they soon will adopt. The L-head type is a good compromise; it is cheap to build and it holds the field for the present, and it is in connection with these only that accurate data can be given.

Two engines may be taken as typical of European construction in this class. One is the 183 cu. in. engine designed in 1913 and in regular construction since that date; it develops 43 hp. The other is a post-war type, 80 x 149 mm., having the same cylindrical capacity, but developing 48 hp. Both are of the L-head type, and are designed for the regular market.

*Mr. Gerster is an eminent French automotive engineer and Mr. Bradley is European correspondent for AUTOMOTIVE INDUSTRIES.

The pre-war 85 x 132 mm. engine ran at 1950 r.p.m. and developed 43 hp. Its piston speed was 8.6 meters/second (1690 ft. p.m.) and the volume of mixture aspired 68 liters/minute (4149 cu. in.). The compression was 4.3 kilos (61 lb). The form of the combustion chamber is shown in Figs. 9 and 10. The engine is equipped with a carburetor of 30 mm. and the gas velocity at the carburetor outlet is 69 meters/second (13,550 ft. p.m.).

The intake manifold is shown in Fig. 11. The section of this pipe increases progressively as it reaches the



Figs. 11 and 11-A—Intake manifold and valve

valves. The intake piping is completely surrounded by the water jacket, thus thoroughly warming the mixture, tending toward good carburetion and preventing condensation in the manifold. In winter this has been found satisfactory. The cylinder casting is made rather more difficult by the passage of the intake manifold between the valves and the cylinders. Cheaper construction is possible by mounting the carburetor on the valve side of the engine and for summer service such an arrangement is preferable.

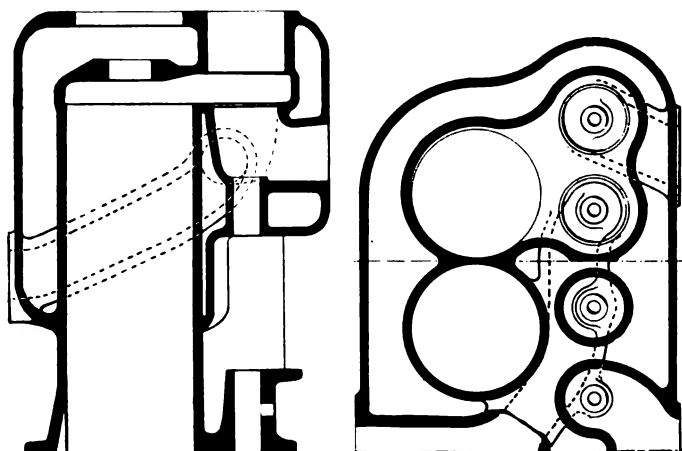
Intake Velocity

The gas velocity (Fig. 11-A) in the intake valves of this engine is 68 meters/second (23,400 ft. p.m.), and in the exhaust valves 62 meters/second (12,200 ft. p.m.). In more modern engines, the same valve lift is given for the inlet as for the exhaust valves and in aviation engines the gas passages are the same for the intake as for the exhaust. The valve springs have been calculated as follows:

$$P = 1.2 \frac{Dm^2 \times \pi}{4} = \frac{1.2 \times 4.4^2 \times 3.14}{4} = 18 \text{ kilos.}$$

The timing is as follows:

Exhaust opens 44 deg. before lower dead center.
Exhaust closes 2 deg. after upper dead center.
Intake opens 4 deg. after upper dead center.
Intake closes 20 deg. after lower dead center.



Figs. 9 and 10—Cylinder block of pre-war type 183 cu. in. engine

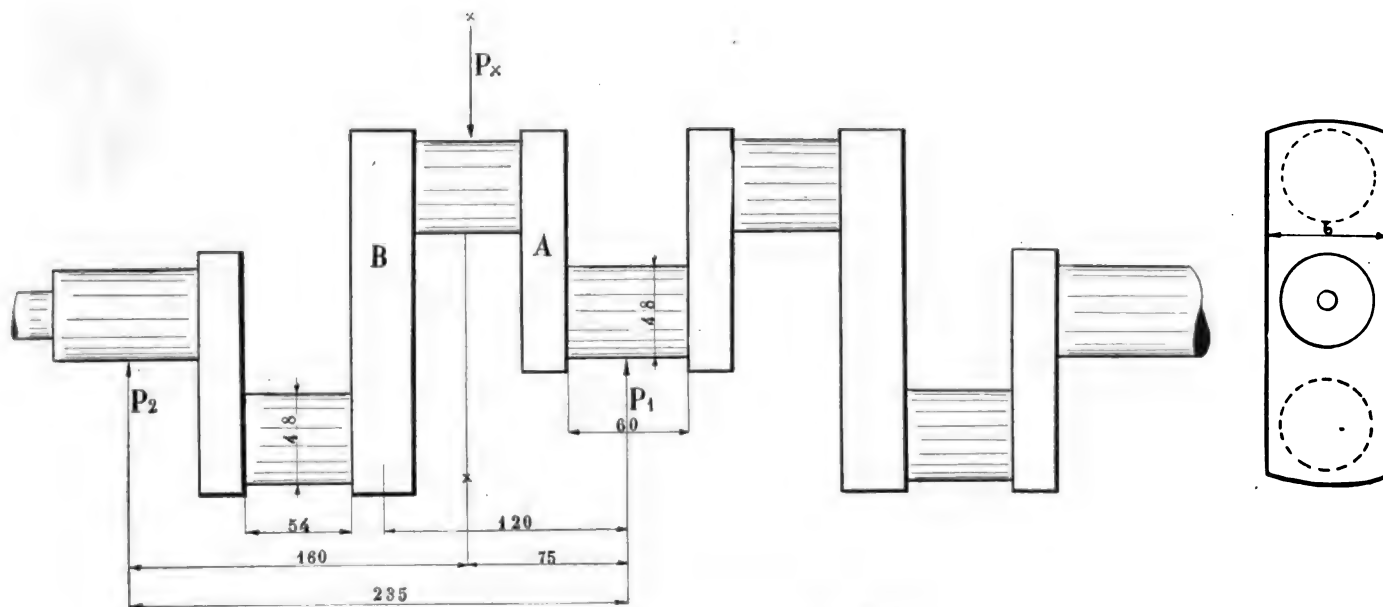


Fig. 12—Crankshaft of pre-war engine

The crankshaft (Fig. 12), which is mounted in three bronze bearings, is of steel, hardened, heat-treated and ground. However, this type of construction has given way to forged shafts with white-metal lined bearings.

The explosion pressure is

$$P = S \times P_x = 56.74 \times 25 = 1400 \text{ kilos.}$$

P_z is taken rather higher than the actual figures to avoid the danger of a weak shaft.

$$P_1 = \frac{P_r \times 160}{235} = 950 \text{ kilos.}$$

$$P_1 = \frac{P_r \times 75}{235} = 450 \text{ kilos.}$$

The moment of resistance above P_x is

$$M = P_s \times 75 = 950 \times 75 = 7100$$

The crankshaft has a diameter of 44 mm.

At this section the metal is loaded

$$S = \frac{M}{W 48} = \frac{7100}{1085} = 7 \text{ kilos.}$$

The web has a section of 24 x 54

$$M = P, \times 4 = 950 \times 4 = 3800$$

$$S = \frac{M}{W} = \frac{M}{\frac{b \times h^3}{6}} = \frac{3800}{6.10} = 6.2 \text{ kilos per sq. mm.} \\ \text{(8800 lb. per sq. in.)}$$

The web has a section of 32 x 54

$$M = P_s \times 12 = 450 \times 12 = 5400$$

$$S = \frac{M}{W} = \frac{5400}{1100} = 5 \text{ kilos (7100 lb. per sq. in.)}$$

Experience has shown that this shaft is just sufficient with steel having a resistance of 50 kilos per sq. mm. (71,100 lb. per sq. in.).

The pressure per square centimeter on the main bearing surfaces are:

Connecting-rod bearings:

$$P = \frac{P_1}{F} = \frac{1400}{4.8 \times 5.4} = 54 \text{ kilos per sq. cm.} \\ \text{(768 lb. per sq. in.)}$$

Main bearings:

$$P = \frac{P_1}{F} = \frac{950}{4.8 \times 6} = 32 \text{ kilos per sq. cm.} \\ (455 \text{ lb. per sq. in.})$$

The piston pin (Fig. 13) is loaded as follows:

$$M = \frac{P_x}{2} \times \frac{b}{2} = 700 \times 3.5 = 2450$$

$$S = \frac{M}{W} = \frac{2450}{572.6} = \begin{matrix} 42.5 \text{ kilos} \\ (602 \text{ lb. per sq. in.}) \end{matrix}$$

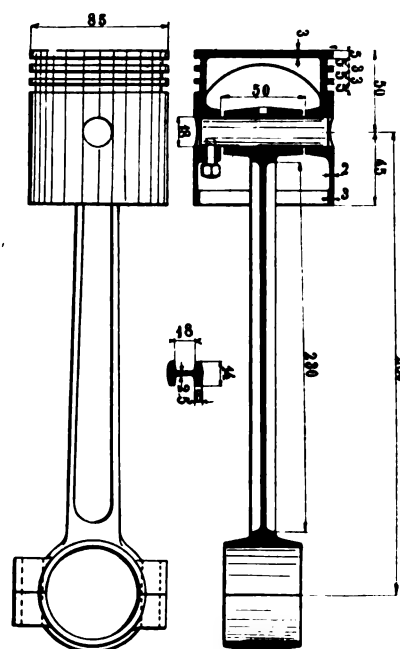
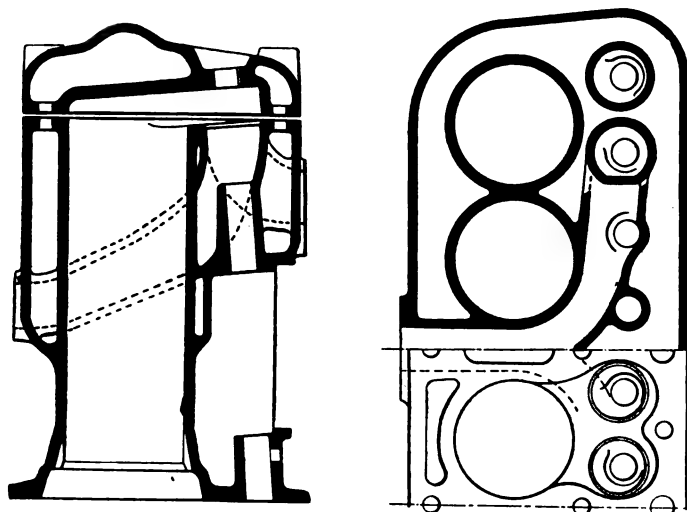


Fig. 13—Piston and connecting rod of pre-war engine

The connecting rod (Fig. 13) is a mild steel forging, loaded to 10.8 kilos under compression and having a factor of safety of 4.8 under flexion by compression.

$$M = \frac{\pi^2 \times T \times E}{6 \times P_r}$$

Lubrication is under pressure, by a gear pump driven by helical gears off the camshaft. The pump delivers 9 liters per minute (2.3 gal.). The gears have 10 teeth, module 3, and a height of 25 mm. The pump runs at 570 r.p.m. A relief valve returns the excess oil to the base-chamber and pressure is 300 grammes per sq. cm. (4.25 lb. per sq. in.).



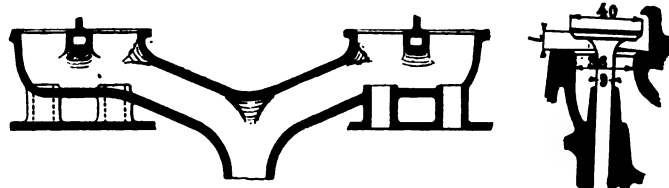
Figs. 14 and 15—Cylinder block of post-war engine

Cooling is by thermo-syphon, the interior diameter of the pipes being 50 mm. (2 in.). Camshaft drive is by chain. This type of drive, however, is tending to disappear, owing to the various inconveniences of the chain and because of the progress made in the cutting of helical gears.

The second engine, which is of more recent construction, has a bore and stroke of 80 x 149 mm. and develops 48 hp. at 2000 r.p.m. A comparison of the values given makes it possible to secure a good idea of the progress made during the last six years. The piston speed has been increased to 9.9 meters/second (1955 ft. per m.). The volume of gas aspired per horsepower-minute is 63.5 liters (3874 cu. in.). The compression is 4.8 kilos (68 lb. per sq. in.).

Removable Head in Recent Design

Figs. 14 and 15 show the shape of the combustion chamber. One of the changes has been the adoption of the detachable head which was taken up by French engineers after America had shown the way. The change facilitates foundry work and machining. The valves are inclined to give a more compact form of combustion chamber and a better passage of the intake pipes. The mean effective pressure is 7.2 kilos (102.4 lb. per sq. in.), and the horsepower per liter of cylinder volume is 16.



Figs. 16 and 16-A—Manifolding

The gas velocity at the carburetor outlet is 71 meters/second (14,000 ft. p.s.). Between the exhaust valve guide and the cylinder the speed is 63 meters/second (12,350 ft. per m.); between the inlet valves it is 61 meters/second (12,000 ft. p.m.) and below the valve it is 45 meters/second (8850 ft. p.m.). This gas passage, as shown in Figs. 16 and 16-A, is too big, but when easy construction is desired it is difficult to avoid such a reduction of gas velocity. In the valves, the gas velocity is 60 meters/second (11,800 ft. p.m.), and at the outlet from the cylinders, with a section of 35 mm., the gas velocity is 21 meters/second (4770 ft. p.m.).

This engine is timed with an exhaust lead of 46 deg., and with a lag of 22 deg. to the intake opening. The crankshaft is carried on two bearings, the crankcase not being divided horizontally. A bolted-on rear plate is used in order to cheapen the cost of production. The main bearings are of bronze, lined with anti-friction metal and the connecting-rod bearings have white metal run in direct.

The crankshaft is a steel drop forging, with a tensile strength of 85—100,000 lb. per sq. in., machined only on the bearing surfaces (Fig. 18). The explosion pressure is about 22 kg. (310 lb. per sq. in.), but in the calculations it has been taken as $P_s = 27$ kg. (390 lb. per sq. in.).

The total pressure on the piston at the moment of explosion therefore becomes:

$$P_x = S \times P_s = 50.26 \times 27.5 = 1400 \text{ kilos.}$$

According to Fig. 18,

$$P_1 = \frac{P_s \times 500}{480} = \frac{1400 \times 500}{480} = 875 \text{ kilos.}$$

$$P_2 = \frac{P_s \times 180}{480} = \frac{1400 \times 180}{480} = 525 \text{ kilos.}$$

The diameter of the shaft being 55 mm., the section X—X is stressed to

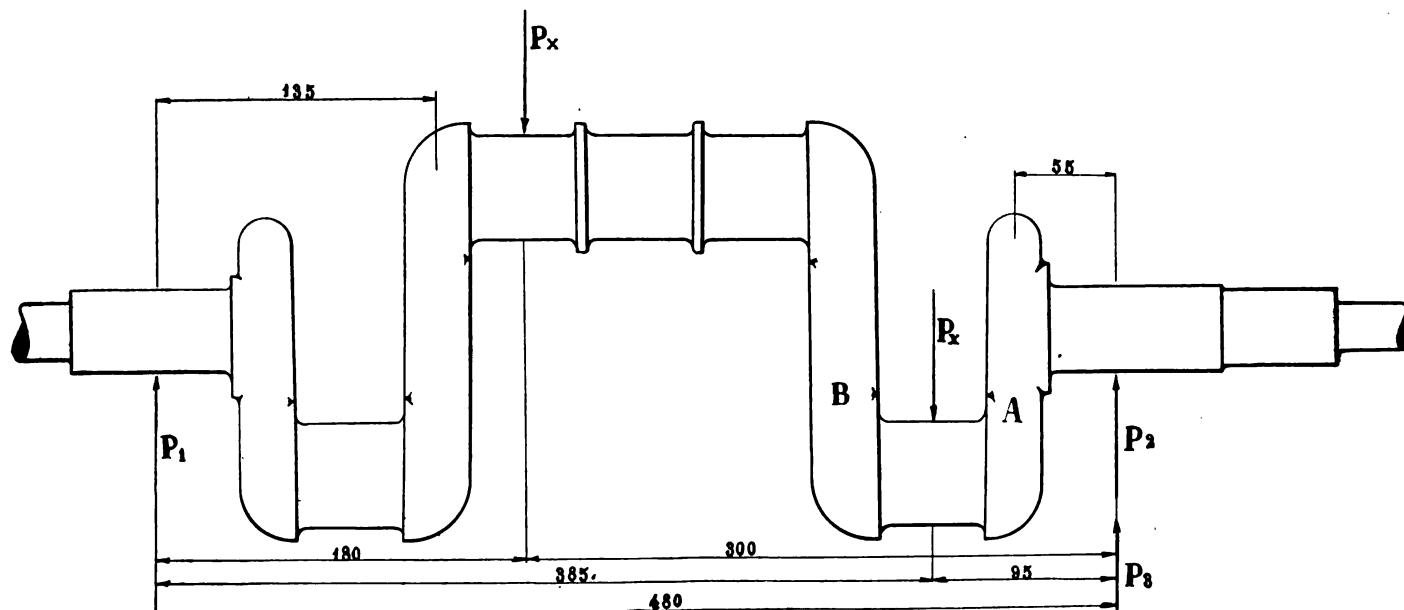


Fig. 17—Crankshaft of post-war engine

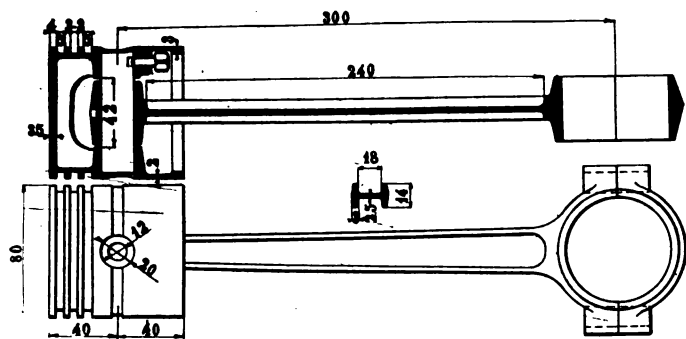


Fig. 18—Piston and connecting rod of post-war engine

$$S = \frac{M}{W} = \frac{P_s \times 18}{W \times 55} = \frac{875 \times 18}{16.33} = 9.7 \text{ kilos. (13,800 lb. per sq. in.)}$$

The web A, which has an oval section, for ease in forging is stressed to

$$P_s = \frac{P_s \times 385}{480} = \frac{1400 \times 385}{480} = 1120 \text{ kilos.}$$

$$M = P_s \times R = 1120 \times 5.5 = 6300$$

$$S = \frac{M}{W} = \frac{6300}{0.785 \times 6.5 \times 1.4} = 6.3 \text{ kilos. (9000 lb. per sq. in.)}$$

The web is stressed to

$$S = \frac{M}{W} = \frac{875 \times 18}{0.785 \times 6.5 \times 1.7} = 7.9 \text{ kilos (11,200 lb. per sq. in.)}$$

The bearings are loaded as follows:

Connecting-rod bearings:

$$p = \frac{P_s}{f} = \frac{1400}{5.5 \times 5.2} = \frac{1400}{28.6} = 49 \text{ kg. per sq. cm. (697 lb. per sq. in.)}$$

Main bearings:

$$p = \frac{P_s}{F} = \frac{1120}{4.5 \times 8} = 31 \text{ kilos per sq. cm. (441 lb. per sq. in.)}$$

The piston pin, which is of case-hardened steel (Fig. 18) is loaded as follows:

$$S = \frac{M}{W} = \frac{P \times 2 \times l_i}{W_s - W_{11}} = \frac{700 \times 2.6}{785 - 170} = 29 \text{ kg. per sq. cm. (412 lb. per sq. in.)}$$

The piston pin is hollow and is of better design than the one in the earlier engine, which is solid.

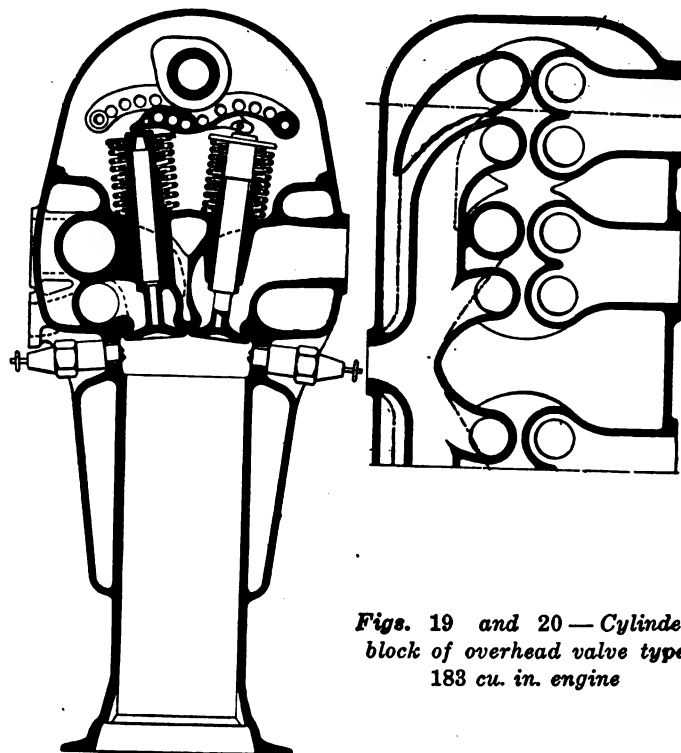
The connecting rod, Fig. 18, is a semi-mild steel drop forging, and is loaded to 10.6 kilos (15,000 lb. per sq. in.) under compression and resists flexion by compression with a factor of safety of 4.2. The camshaft is carried in two bearings only and is loaded under flexion to 9 kilos (12,800 lb. per sq. in.).

Oil Pump Capacity

The oil pump delivers 11 liters (2.9 gal.) per minute. The timing gears are cut with helical teeth and are steel against cast iron. The fan, which has a diameter of 360 mm., runs at 2800 r.p.m. Cooling is by thermo-syphon, with inlet and outlet pipes of 55 mm. diameter.

This type of engine is cheap to build. Its 30 mm. carburetor allows it to throttle down perfectly and gives it a rapid pick-up. Both the types described are of simple construction and are durable, while developing sufficient power for service on comparatively heavy chassis taking five-passenger bodies.

It is also possible to build intermediate types between the stock, cheap production 183 cu. in. engine and the special racing machine. There is, in Europe, a rather pronounced tendency in favor of these high-efficiency engines which, while not being pure racing models, are nevertheless fast types. Naturally they are costly engines to



Figs. 19 and 20—Cylinder block of overhead valve type 183 cu. in. engine

build. They must have a hemispheric combustion chamber and generally four valves in the head, operated by an overhead camshaft. An interesting engine of this type, shown in Figs 19 and 20, has two sets of inlet valves and a double carburetor. One carburetor feeds the engine through the big valves. This makes it possible to throttle down and get satisfactory slow running and at the same time to obtain a great amount of flexibility. With an engine on these semi-racing lines it is possible to obtain from 50 to 80 hp.

Chassis Features

Except that they invariably have four speeds, the chassis of the European 183 cu. in. engines do not present great departures from American practice. It is difficult to make a close comparison for, with hardly any exceptions, the American car with a small engine has been a cheap car, whereas in Europe many of the small cars are quite equal in quality to the largest machines.

Before the war, the weight of both the chassis and of the complete European 183 cu. in. car was generally heavier than on American machines of approximately the same piston displacement. Sustained high speeds over rough roads tended toward a heavy chassis construction.

Since the war there has been a considerable all-round reduction in the weights of chassis. This has been obtained first by improved design, including the adoption of unit construction of engine and gearbox, with aluminum castings for crankcase and gearbox, the abolition of the sub-frame, more modern rear axle.

A good average weight of complete chassis is 1900 lb., and of the complete car, with water, gas and oil, 3000 lb. There are a few lighter cars on the market but none with chassis weight including tires below 1700 lb.

The racing Sunbeam gear ratios, laid out for average roads, are of interest. With driving wheels of 880 x 120, the driving pinion and crown wheel were 23-72, giving a direct drive ratio of 3.13 to 1. The other ratios were as follows:

Third speed	.....3.9 to 1
Second speed	.....5.8 to 1
First speed	.....8.8 to 1

Heat Treating Steel by New Method Claims Valuable Results

The material is quenched at a definite point in the heating when the temperature rise shows a marked decrease and a change from the previous uniform rate. This article, with special reference to automotive work, explains the process and the improvements claimed for it.

A NEW method for the heat treatment of steel has recently been introduced. The hump method, as it is known and patented, utilizes the outward manifestation of changes in internal structure which takes place when steel is heated past the so-called critical or transformation point to indicate when the work should be withdrawn from the furnace. The temperature of the furnace and, therefore, of the work, is raised at a uniform rate until the transformation point of the steel is reached. At this time, there will be a marked decrease in the rate of temperature rise. The change in the rate of rise is made plainly visible to the operator by an autographic recorder connected to a thermocouple placed close to or in contact with the work. The effect is clearly shown by a bend or hump in the curve, as at C, Fig. 1.

This hump corresponds to a pause in temperature rise or decrease in rate of heating of the steel, which occurs in spite of the fact that heat is being transferred to the work during this interval as rapidly as before or after. It is explained by metallurgists as being due to the dissolving of cementite, or carbide of iron, in the pure iron, or ferrite, and to other chemical and physical changes, depending upon the composition of the steel. By microscopical and chemical means, it is known that the physical and chemical structure of steel after quenching is profoundly influenced by the relative time of quenching with respect to the time at which the arrest occurs. The hardness, strength, ductility and toughness are each definitely influenced.

Inaccuracies with Pyrometers

As a guide in hardening, the temperature pause, or decalescence point, as it is called, is much more reliable than is the furnace temperature as indicated by a pyrometer. If the work be controlled with reference to temperature readings only, there are several possible sources of error, namely:

(a) The thermocouple may be at a temperature different from that of the work, due either to insufficient time having elapsed for the work to assume the furnace temperature or to inequalities in tem-

perature between different parts of the furnace. Experiments which have been made with commutating recording pyrometers connected to read alternately upon two or more thermocouples in a single furnace show how surprising differences in temperature persist even after prolonged "soaking". To insure that the work shall actually reach the desired temperature within a reasonable time, the furnace is often held at a higher temperature, which is afterwards reduced. The "soaking" and possible overheating of the work may, and often do, result in injurious growth in grain size in metal being treated.

(b) In attempting to hold the furnace at a constant temperature, the temperature may fluctuate and, even though it may subsequently be reduced to the proper temperature, the work may nevertheless have been overheated and injured. In the hump method, the quench is made as soon as the work is at the right distance above the critical point and the work is given no opportunity to reach an excessive temperature.

(c) The temperature which is assumed as the critical temperature of the steel may not be correct. On the other hand, using the hump method, the time at which each lot of material passes through the critical point is definitely located.

The lead pot and the fused salt bath methods of heating work for hardening give greater assurance than does the

ordinary furnace that the work shall reach a uniform temperature, but there still remain uncertainties as to the actual transformation temperature and as to accuracy of the temperature measurement, and growth in grain size, due to too long immersion, may occur. Lead or salt baths give no control whatever of the rate of heating. Hardening baths also have many practical disadvantages, such as expense, dirt, necessity of cleaning the work, space occupied, etc.

(d) The pyrometer used for measuring furnace temperature may be incorrect.

Accuracy of Instrument Not Essential

The user of the hump method need not concern himself about the absolute accuracy of his pyrometer, nor bother

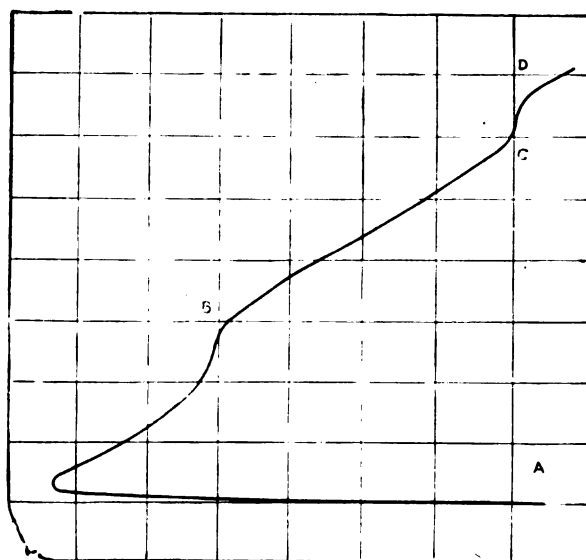


Fig. 1—Chart from a curve-drawing pyrometer showing hump C-D due to passing of steel through the transformation point

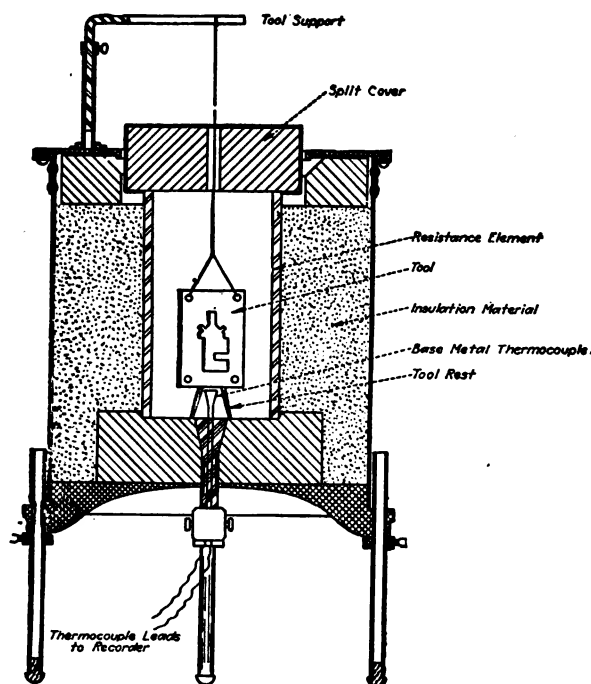


Fig. 2—Electric furnace used for heat treatment of tools, dies, etc., by the hump method

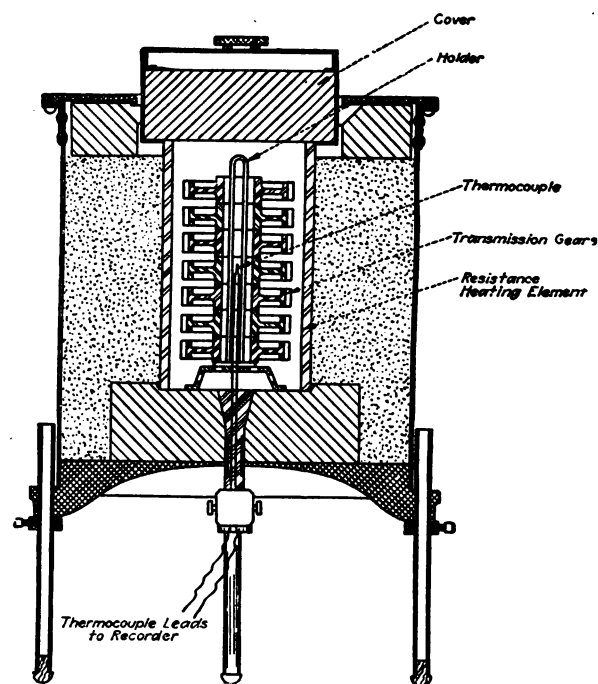


Fig. 3—Electric furnace used in the commercial production of automobile gears by the hump method

with independent transformation point determinations. It is not at all necessary that the temperature indicated by the thermocouple should be the correct temperature of the work, for so long as the recorder connected to the thermocouple shows clearly the pause in temperature rise, the moment at which transformation occurs is definitely known. Having learned by trial just how many minutes should elapse after the beginning or end of the transformation before the work is removed from the furnace, he is upon sure ground and can repeat results.

Method of Operation

Uniform, standardized conditions and a control of the rate of heating the work are essential to the hump method of heat treatment. A small furnace for heat-treating tools, dies, etc., is shown in Fig. 2. The heating element consists of a vertical, cylindrical resistor, surrounded by insulating material in a sheet-iron jacket. The resistor rests upon a refractory block, which is supported by a cast-iron bottom plate. The heating chamber is closed at the top by a refractory cover, while a cast-iron top-plate confines the loose insulating material, filling the space between resistor and jacket. An iron-constantin thermocouple of bare No. 8 gage wire projects upward from the center of the bottom refractory block.

By means of a small wire attached to a tool support on the top plate of the furnace, the work to be treated can be suspended in close proximity to, or touching, the end of the thermocouple. In production furnaces other methods of supporting the work are used. For example, in the furnace shown in Fig. 3, designed for heat-treatment of automobile transmission gears, the work is placed upon holders before insertion in the furnace. Covers placed on the furnace completely close in the heating chamber, preventing renewal of the atmosphere and the work is thus protected against oxidation and scaling.

At the moment when the work is introduced into the furnace, the temperature of the latter is, say, 1400 deg. F., but, the heat storage capacity of the furnace walls being small compared with that of the charge, the temperatures of both thermocouple and furnace walls drop rapidly a few

hundred degrees, the current through the heating element or resistor being shut off during this time. The result can be seen in the chart made by a curve-drawing pyrometer connected to a thermocouple located in a furnace operated in the manner just described, as reproduced in Fig. 1. The temperature drops rapidly from 1400 deg. F. at A to about 870 deg. F., and then rises slowly to B, where it is stationary, the thermocouple, furnace walls, and all parts, small and large, of the charge having reached approximately the same temperature. The switch is then closed, the input being so regulated that the temperature rises at the desired rate. The fact that the work and furnace start from the same temperature at B, far below the critical point, coupled with a proper arrangement of the heating element, with respect to the charge, insures that all parts of the work will go through the critical point at the same time.

The arrival of the work at the transformation point C causes an abrupt change in the rate of heating, due to the suddenly increased capacity of the steel to store heat, the temperature stops rising or proceeds much more slowly than before, although the rate of supply of heat energy has not been changed. However, once the transformation is completed, as at D, the temperature again rises rapidly. The pause is plainly shown by the hump in the curve.

Before quenching, it is necessary to heat the work for a certain time after this point, the time depending on the mass and shape of the steel, the quenching medium employed and the qualities desired. The exact further heating to be allowed after the completion of the transformation point is learned by experience or trial but, once known, all uncertainty as to the result is practically eliminated.

Uniformity of Structure

It is claimed that each piece of work carried the same distance beyond the reference point C or D will show the same internal structure. This is true whether the temperature represented at the point C on the chart is correct and whether it is the actual temperature of the steel at that moment. The important fact is that the chart tells

the attendant when the steel is going through the transformation, from which he may know that quenching after a certain interval will secure the desired physical qualities. Furthermore, the chart remains as a record of just how each individual lot of steel was treated and can be referred to in connection with properties developed in physical tests of that steel.

It is found that the rate of temperature increase has a marked influence upon the properties exhibited by the steel after quenching. The resistance furnace is admirably adapted for controlling the rate of temperature rise, since the rate of energy input is easily regulated by reference to an ammeter supplied as part of the furnace equipment. The potentiometer pyrometer, Fig. 4, is likewise peculiarly suited for carrying out the hump method of heat treatment, and it is sensitive to small changes in thermocouple e.m.f. and exhibits changes in rate of temperature rise upon a magnified scale.

Used in Hardening Tools

As an example of the use of the electric furnace in hardening tools, the manner in which punches and dies are produced in a shop where this method has been used exclusively for the past six years will be described. One of these punches and dies is shown in Fig. 5. The punch is first made in the ordinary way by machining and hand finishing. It is easy to secure accuracy in the making of a punch, as all measuring, gaging, etc., is done on the outside. The die is made to approximately the correct size, but slightly smaller. The punch, having been hardened and ground to exact dimensions,

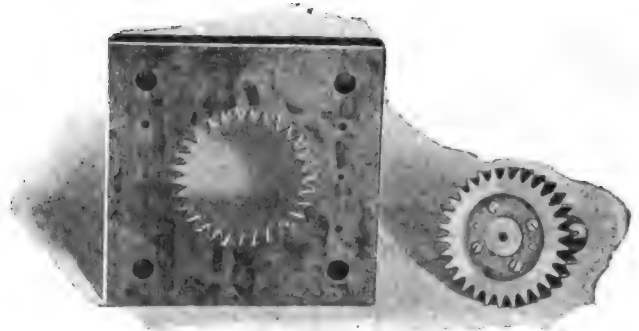


Fig. 5—Blanking punch and die hardened by the hump method. The die was broached by the punch and then hardened

is then used as a broach to cut the die. It is forced into the die a short distance, raising a burr, which is removed by filing, the operation being repeated until the cut is finished. The die is then relieved, but no further work is done on the cutting edge. After hardening the die by the hump method, the size and shape are found to be so exact with respect to the punch that subsequent work, as stoning or grinding, is not required.

In Quantity Production

Production operations are greatly simplified by the use of electric heat-treating furnaces with the hump method. As an example refer to Fig. 6. Formerly in this plant automobile transmission gears were heated for hardening in lead pots located in the basement beneath the machine shop. After the gears had been machined, they were removed on trucks to an elevator, lowered to the heat-treating room, an uncomfortable place because of heat and fumes, and wheeled to the lead pots. The gears were placed in the lead pots in batches and, when they had come up to temperature, were lifted out one at a time and dropped into the oil-quenching bath. The time of heating in the lead pots was thus not the same for all pieces, and the temperature also varied with the location in the pot, possibly resulting in non-uniform hardness and grain structure. The gears were also sometimes injured by dropping upon one another in the quenching tank. The drawing was done in gas furnaces, followed by an oil quench. Upon their return to the machine shop, the gears were wire-brushed to remove adhering lead.

Electric Furnace in Machine Shop

The electric furnace equipment replacing the lead pots and gas furnace is located in the machine shop itself. There are six electric hardening furnaces located on two sides about a quenching tank, with three electric annealing furnaces on the remaining side, also a drain grid and the cleansing bath between the quenching tank and the annealing furnaces. The tops of all furnaces and tanks are flush with an elevated platform. The work is brought on trucks to the edge of the platform, where a boy arranges the gears upon holders, which are easily picked up by the operator, and upon which the gears remain until they have passed in turn through hardening furnace, quenching tank, cleansing bath and drawing furnace. Corresponding to each hardening furnace, there is a curve-drawing recorder, and for each drawing furnace an auto-

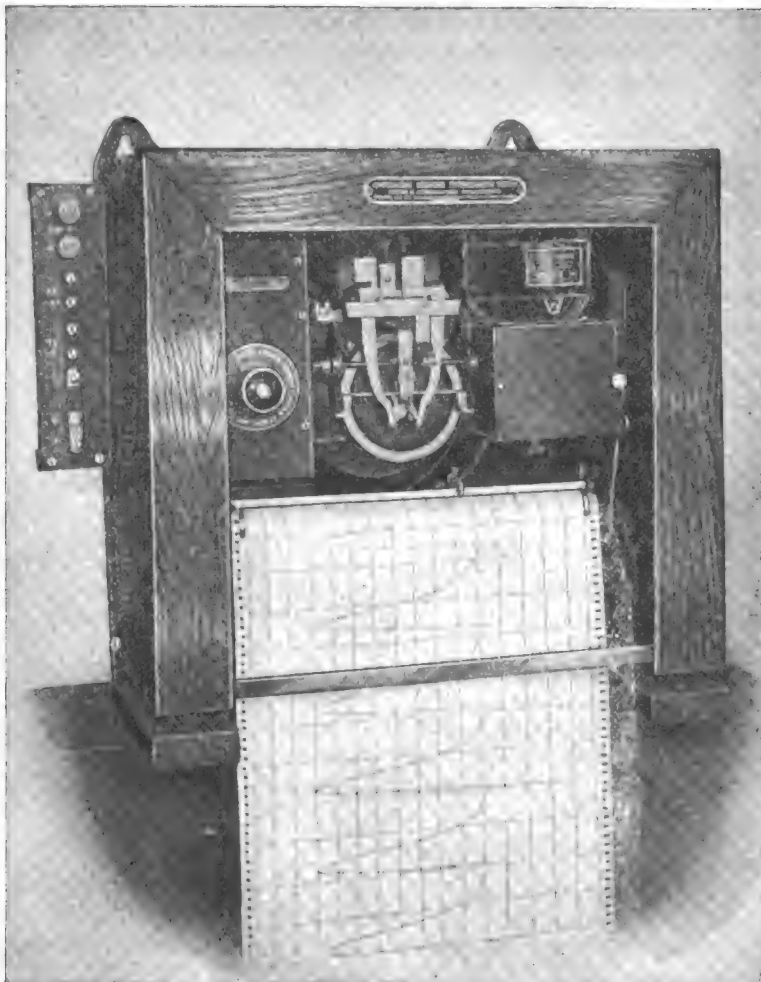


Fig. 4—Curve-drawing potentiometer pyrometer used in connection with the hump method of heat treatment

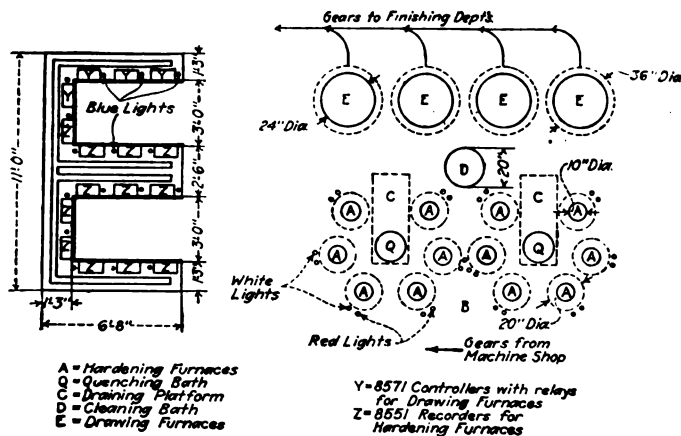


Fig 6—Layout of hump method heat treatment equipment in the machine shop of an automobile gear plant

matic temperature recording controller, all mounted upon a wall nearby, where also are the furnace rheostats. An assistant foreman on duty at this point directs the opera-

tions according to the indications of the curve-drawing recorders connected to the hardening furnaces.

The higher cost of electrical energy as compared with other sources of heat energy, is said to be more than repaid by the saving in necessary apparatus, such as pumps, blowers, burners, etc., and the labor costs, as the electric furnace can be located in the machine shop in the direct line of manufacture, thus saving the double handling of the work which is necessary where the latter must be taken from the machine shop to a hardening room and then back again.

Other advantages claimed for the use of the hump method in regular manufacturing are that it results in a higher grade, a more uniform output and simplifies handling and cleaning.

The hump method of heat treatment is controlled by the Leeds & Northrup Co., which company also manufactures the electric furnaces and curve-drawing pyrometers used in carrying out the process. Equipments for large-scale commercial production are used by the manufacturers of the Packard, Hudson, Dort and Nash motor cars, by the Detroit Gear & Machine and Brown-Lipe Gear companies and others in the automotive field.

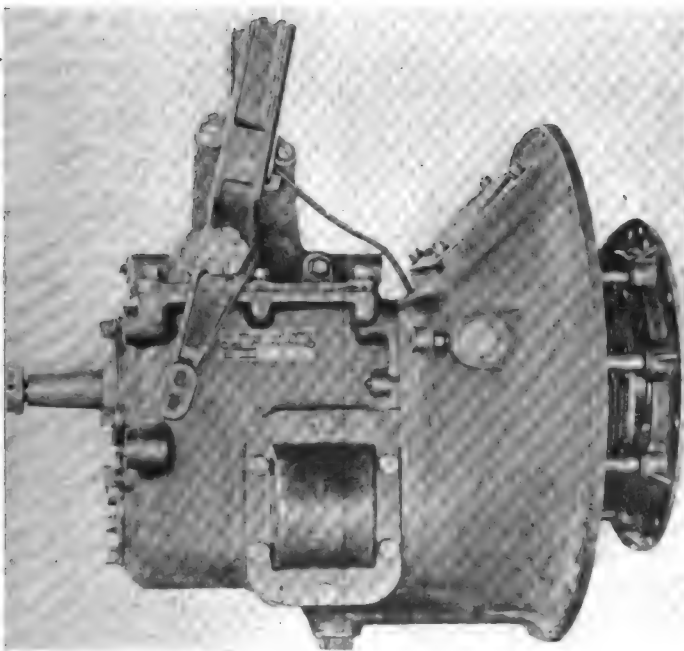
Gearset for Pneumatic Tired Truck

WITH the industry alive to the fact that rapid development is coming in the pneumatic tired trucks in the larger sizes, announcements of parts manufacturers of units suited for this purpose will be expected. A gearset has been brought out by the Fuller & Sons Mfg. Co., particularly designed for this class of work, as it has a low gear ratio of 4 to 1 and a standard S. A. E. opening on the right side for power take-off and on the left side for attaching a tire pump. This ratio is designed to meet the needs of pneumatic trucks, and also at the same time to fit different types of engines. The intermediate ratio is 1.7 to 1, and the reverse 3.5 to 1.

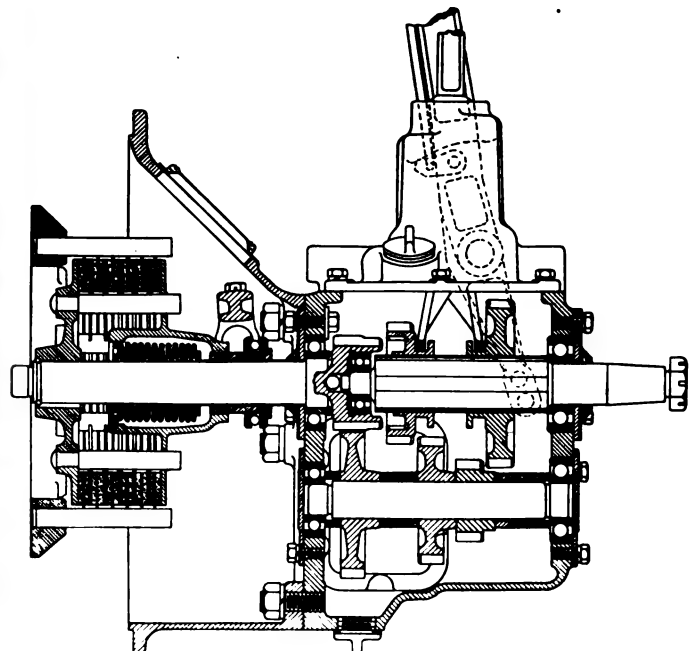
With the power take-off on the right side of the gearset, the engine can be utilized in the usual manner for operating dump bodies, hoists, winches and any other forms

of mechanical devices requiring engine power. The structure and design of the gearset is illustrated in the accompanying sectional assembly. It is fitted with annular ball bearings throughout with a positive interlock on all speeds. The gears and shafts are made of $3\frac{1}{2}$ per cent nickel steel, hardened and heat treated to give the necessary hard wearing surface and tough core.

This unit includes the clutch, which is a multiple disk type of saw steel with asbestos fabric facings. It is made in units suitable for $1\frac{1}{2}$ - and 2-ton trucks, unit powerplants, and a 2-ton type for amidships mounting. All of the dimensions are S. A. E. standard, the shift being the standard three-speed type. Mounting of clutch driving plate is S. A. E. standard for multiple disk clutches, as are all the other connecting and mounting dimensions.



Fuller gearset, made in two models



Section of gearset and unit powerplant

Automotive Products Made in Canada Expand in Quantity and Volume

An analysis of the manufacturing facilities of the Dominion is given herewith by a well-informed Canadian. In a measure, the article is supplemental to the analysis of the registration figures published in the recent Statistical Issue but this is devoted primarily to actual production there.

SOME conception of the growth of the automotive industry in the Dominion of Canada is glimpsed from the recently released statistics of the Automotive Industries of Canada (the National Automobile Chamber of Commerce of the Dominion). Nothing could be more impressive and striking in the growth of the Canadian industry than the statistics showing the annual registration of passenger cars and trucks in the nine provinces and the extent of value involved in production.

A few years ago the Canadian motor industry was considered almost negligible. To-day the automotive industry in this country employs more than 15,000 workers and represents an investment of more than \$100,000,000. Last year the total value of sales amounted to over \$100,000,000 and the payroll exceeded \$15,000,000. During 1919 more than 94,000 Canadian motor vehicles were manufactured and it is safe to say this figure will be increased for 1920 by nearly 35 per cent, despite the untoward material and coal situation. The latest registration figures indicate that there are now close to 350,000 motor vehicles in operation in the Dominion.

Last year Canada imported from the States some 10,600 motor vehicles, of which nearly 9000 were passenger cars. Thus Canada was the best passenger car export market the United States has, buying roughly one American-made motor vehicle for every five of domestic manufacture. It is a matter of simple mathematics, then, that upward of 40,000 Canadian-made motor vehicles were exported. Canada, be it remembered, on the basis of population does five times the volume of foreign business of the United States.

The made-in-Canada automobile is a reality. Substantial factories for the production of engines, automotive equipment and tires have been built and manufacturers have invested upward of \$100,000,000 in this Canadian industry, as aforementioned.

The automobile and equipment industry in Canada may be said to be practically confined to the Province of Ontario. In Toronto there are a number of automotive factories. Only one motor-car factory—the Willys Overland, Ltd.—is located there, but there are several tire plants and numerous companies manufacturing automobile parts, supplies, materials and equipment, such as cylinder and other castings and stampings, storage batteries, horns, lamps, floor boards, carpets, bumpers, chains, tools, enamels, paints, finishes, lenses, etc. At Oshawa there are three large plants of the General Motors Corp. of Canada, where the McLaughlin, Chevrolet and Oldsmobile cars are manufactured. During the past year extensive construction plans have been carried out at that town involving the expenditure of nearly \$3,000,000. At Walkerville and Ford City the same building activity was

evident in 1919 as at Oshawa. Nearly \$5,000,000 was spent in constructing automobile plants, and block after block of workmen's homes were built. These houses are to be sold to the employees on a deferred-payment plan ranging in price from \$5,000 to \$10,000 each.

The Firestone Tire & Rubber Co. of Canada, Ltd., is constructing a \$5,000,000 plant at Hamilton and the Dunlop Tire and Rubber Goods Company, Ltd., is erecting a \$1,500,000 addition to its Toronto plant.

Other centers in which motor cars and trucks are manufactured are Kitchener, Chatham, London, Hamilton, Ottawa, Brockville and Montreal. As to parts, supplies and equipment, there are over a score of cities and towns in which they are produced. For instance, at Hamilton foot pumps, stampings, drop forgings, door hinges, door locks, bracket irons and various other motor details are manufactured; transmissions, differential gears, radiators and various forged parts at St. Catharines; fenders and bodies at Oshawa, Ford and Orillia; grease cups, spring shackle bolts, spark plugs, seat springs, etc., at Windsor; windshields, hub caps, running-board moldings and brackets, cushion retainers, robe and foot rails, scuff plates, floor-board moldings and various pressed-steel parts at Walkerville, Toronto and Oshawa; nuts and bolts at Ingersoll; tacks, nails and clinch buttons at Galt; tops at Toronto and Walkerville; tires at Toronto, Kitchener, Hamilton, Oakville, Montreal and Bowmanville; wheels at Windsor and Chatham, and innumerable other items in many towns throughout the Province of Ontario.

As this situation indicates, before long automobile requirements may be entirely produced within the Dominion and few parts may be imported. In view of that fact, the Canadian automobile export business will be greatly increased as it comes within the provisions of the preferential tariff decided upon by the Imperial authorities for export to the United Kingdom, this law going into effect Sept. 1, 1919. That means, in order to be entitled to one-third off the full customs rate, the total value of the manufactured motor vehicle in its finished condition must be not less than 25 per cent the result of labor within the British Empire, the proportion being calculated in accordance with the following detailed regulations:

"Where a number of separate articles are included in one parcel or shipment, each and every article shall be considered separately for the purpose of calculating the proportion of value due to labor within the Empire. For the purpose of these regulations, the total value of a motor car shall be its cost to the manufacturer at the factory or works, and shall include the value of the containers and other forms of interior packing ordinarily sold with it, when it is sold retail, but shall not include the manufacturer's or exporter's profit or the cost of exterior packing,

carriage to port and other charges incidental to the export of the goods subsequent to their manufacture."

In calculating the proportion of value which is the result of labor within the British Empire, there may be included under the head of labor the cost to the manufacturer of any materials of purely Empire origin entering into the composition of the car, the cost of manufacture, including wages, proportion of fuel, supervision and other factory expenses, and the cost of the labor of packing for retail sale. The following may not be included in the proportion of value which is the result of Empire labor. Any materials or interior packings not entirely of Empire origin; manufacturer's profit or the profit or remuneration of any trader, agent, or person dealing in the automobile in its finished condition; the expense of placing the goods in outside packages for export, and the cost of such packages, transportation, insurance and other charges for service after the motor vehicle leaves the place of production.

As a matter of fact, the Canadian automobile is much over 25 per cent the result of labor within Canada. The Canadian-made Ford, for instance, is 95 per cent Canadian by value. Accordingly, the year 1920 will see a vastly larger automobile export business to the various nations in the British Empire than heretofore.

From all indications, the demand for Canadian motor

vehicles far exceeds the supply. This will be aggravated if the high rate of exchange between Canada and the United States prevails many months, as the spring season brings a host of purchasers. The Canadian factories are rushing production to the utmost limit, many have doubled their plants' production capacity, but motor-car manufacturers and parts makers are somewhat restricted in not being able to secure fuel, glass, steel and other materials. Taking everything into consideration, this year promises to be an exceptionally active period in the Canadian motor-car industry, which has assumed a pace of advancement and prosperity auguring well for all those connected with its ramifications.

Three months ago there were approximately 1600 automobile dealers and distributors in the Dominion, 2264 garage and service stations and 500 automotive equipment and accessory jobbers and dealers. A surprise to many will be the statement that there are 53 tire manufacturers in Canada.

For those interested in the distribution of these automobile agencies, dealers, garages, service and supply stations, the following is given: Alberta, 432; British Columbia, 361; Manitoba, 107; New Brunswick, 107; Newfoundland, 6; Nova Scotia, 148; Prince Edward Island, 0; Ontario, 1460; Quebec, 474; Saskatchewan, 712.

Air Cleaned Through Wet Sponge

A GAINST air cleaners of the dry type the objection is raised that they do not remove the impalpable dust, because this dust is not heavy enough to be precipitated either by centrifugal force or by gravity. Wet-type air cleaners in which the air passes under and through water, will remove all the dust only when the bubbles formed by the air rising through the water are exceedingly small. This, of course, is allowed for in many wet cleaners by placing fine mesh screens in the water to break up the bubbles.

A new type of air cleaner in which water is used has been developed by the Midwest Engine Co. The method of cleaning the air in this device is to draw it through

the pores of a wet sponge saturated through its capillarity by resting in about $\frac{1}{4}$ in. of water maintained automatically and supplied from the transparent reservoir above.

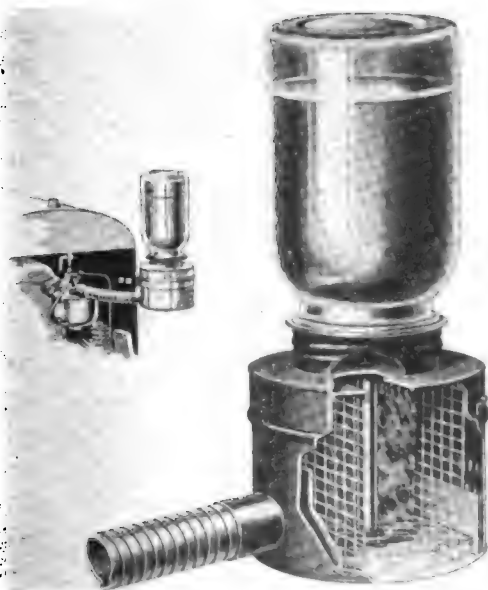
As the air zigzags through the pores, the dust is caught by the wet surfaces and held on the surface of and in the pores of the sponge. The sponge is washed out once or twice a day, depending upon the amount of dust in the air.

As the cleaner is used, dust will begin to work through the sponge, and if the day is very dusty the dirt may penetrate one quarter the way through. Every time the reservoir is filled, which will be once or twice a day, the sponge should be taken out and thoroughly washed in a bucket of water, put back and the reservoir put in place. There is a hole through the sponge for the feed pipe. When the reservoir is inverted, water will flow into the sponge cup until the end of the tube is covered, and as the water passes up by capillary attraction through the pores, more water will be fed to the sponge cup. Little water is said to be taken up by the air in this cleaner because the air cannot pick up globules of water, but only absorb sufficient for complete saturation.

Money and Men

THE labor turnover of a large shipbuilding plant near Philadelphia was 334.7 per cent during the year 1919. Each new employee at this plant is estimated to cost \$50, and 23,520 were hired during the year. Thus the total cost of the labor turnover to that company was \$1,176,000. The plant maintains a working force of about 7000 to 9000 men.

Labor turnover is entirely a personnel problem; the human element plays the major part in making it greater or less. When such costs as \$1,000,000 a year for turnover are not uncommon in large plants, the necessity for a very careful and systematic study of this human element becomes apparent.



Midwest sponge type air cleaner

The Restriction of Trading with European Countries

Little real information as to such regulations has been extant in this country, states the New York office of the Bureau of Foreign and Domestic Commerce, and this article was written to explain some of them.

By G. F. Bauer*

IN numerous countries laws are constantly being enacted, modified, or repealed in an effort to secure some relief from the effects of oppressing economic conditions. Especially is this true in those countries of Europe which are confronted with intricate problems in the readjustment of their national affairs to peace conditions. In such European countries, laws providing for the control of trade, perhaps better known as "trade restrictions," are required for the purpose, principally, of stabilizing exchange.

The adverse rates of exchange are partly a result of the present condition in our own foreign trade when our exports of merchandise to European countries continue to exceed by far our imports of goods from these countries. In order to counteract to them this ruinous tendency of importing far in excess of exporting, the European nations have resorted to various systems of trade restrictions, which, although different in detail, are all based on certain identical economic principles. The legislation formulated on these basic principles may be readily divided into seven distinct groups.

In the first group are included such laws as provide for a complete control of all imports. For instance, no imports into Austria from countries not included in the former Austro-Hungarian monarchy are permitted except under license. Application for such a license must be made to the Ministry of Finance at Vienna. The granting of it is dependent on this official, who must be satisfied that the goods are actually required and not superfluous luxuries and also that the importer is a regular merchant who will sell the goods at reasonable prices and see that they are not acquired by speculators. Another country with a drastic law of this kind is Bulgaria. The *Devizna Tzentrале* of the Bulgarian National Bank is authorized to grant or withhold licenses according to the importance of the goods from the point of view of national economy. Thus, at the present time, Austria and Bulgaria are the two European countries which have a complete control of all imports.

In the consideration of the second group of laws, which provide for a partial control of certain imports only, it will be noted that to this principle the greater number of European nations adhere. Especially is this characteristic in those countries which have revised their customs tariff to meet changed conditions. For that reason, France and Czechoslovakia have a partial control of imports only. Italy is also revising its customs tariff and it is simultaneously reducing the number of restricted imports. In Portugal, the import restrictions are applicable to ninety-five commodities only. On Nov. 14, the Polish

Government published a long list of articles that might be imported into Poland without special license, so that at the present time a permit is only required in cases where it is desired to import an article of a luxurious character. In Esthonia and Roumania, there is a tendency to permit the importation of all necessities, including manufactured wares, and to prohibit entirely imports of luxuries. In Germany, however, raw materials and certain food products are the only articles included in the free lists for which no special license is required, while the imports of manufactured wares are generally restricted.

The United Kingdom originally proposed to restrict the importation of commodities that might be considered as products of its key industries, among which were included the manufacture of magnetos and optical instruments. The British courts, however, ruled as illegal such import restrictions and, since Dec. 20, 1919, no special license has been required to import into England any commodity whatsoever, including the products of the unstable industries. In Belgium, import licenses have been dispensed with, except in the cases of certain German products that might offer severe competition to such Belgian industries as have not fully recovered from the effects of the war. In Switzerland, the importation of coal is subject to control by the *Societe Cooperative Suisse des Charbon*, which has its headquarters at Basle.

The next or third group includes not exactly legislation but rather agreements having for their purpose a voluntary control of imports. There was considerable agitation in all the Scandinavian countries to control imports in this manner. As a result, Denmark and Sweden are now actually trying to offset the effects of an unfavorable balance of trade with no means other than voluntary cooperation of its bankers and merchants.

There are provided in the fourth group restrictions not only on the imports themselves but also on the exchange required in the payment for such imports. In Austria the term of payment must be approved by the *Devisen Zentrale*. Six months' credit, or payment in installments of three, six, nine or twelve months, is usually insisted on. An exception is made for foodstuffs urgently required, for the payment of which foreign exchange may be obtained from the *Devisen Zentrale*. It has also been decided that the value of all goods imported into Bulgaria must be deposited within a period of from one to two months with the Bulgarian National Bank in the name of the exporter or the consignor of such goods. This money is sequestered for a period of from 10 to 12 months, counting from the date of importation. The bank pays 4 per cent on the sums thus deposited, and, in case they are converted into treasury bonds, 5½ per cent. The money thus held to the credit of the depositor may be

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released from sequestration before the expiration of the time limit in cases where it is desired to purchase therewith Bulgarian products. A ruling by the Ministry of Finance in Greece requires all importers to make a deposit of 20 per cent with local banks when placing any order outside of that country. Sworn statements must be made that the goods will be used exclusively in Greece. The deposit will not be refunded until the Greek customs certificate is shown and the transaction then checked by the Ministry. A lapse of 6 months without delivery will cause a forfeiture of the guaranty, which goes to the government. Failure to make the 20 per cent deposit prevents the banks from remitting abroad. This virtually abolishes open credit and consignment dealings and requires special caution on part of both buyer and seller. In Czechoslovakia, the *Devisen Zentrale* fixes the rates of exchange and also controls credits in foreign countries. It also is stated that the Portuguese banks are not permitted to sell foreign exchange unless authorized to that effect by a special commission. In view of the continued demoralization of the exchange, the Italian Ministry of the Treasury recently issued an order suspending stock-exchange dealings in foreign exchange. By means of an embargo on gold, the United Kingdom, France and Germany still exercise a direct control over a medium of exchange that is most suitable for the payment of imports.

The foregoing groups cover laws of a restrictive nature which have been enacted in European countries for the control of imports. Similar laws, but for the control of exports, also are being enforced. Consequently, there might be placed in the fifth group such laws as provide for a complete control of all exports. Only two European countries have taken this drastic step and they have, at a comparatively recent date only, gained their independence, namely, Czechoslovakia and Esthonia.

Although the German Government controls provisionally all exports, there is a marked tendency on the part of the German Government to establish a free list of articles that may be exported without license. It is therefore probably best to include the German legislation in the sixth group. In that group would be classed, therefore, such laws as provide for a partial control of the exports of certain commodities only. To this modified form of export legislation such conservative nations as France, Italy and Belgium have resorted.

The Austrian Government is now preparing a list of articles that may not be exported except under license. It is indeed possible that no license will be required in order to export manufactured articles of luxury, even if made of materials of which the supply is short, such as textiles,

leather and metals. The exportation of all Polish products is permitted with the exception of those which are needed in Poland and of which there is no surplus above the local needs. Although all restrictive measures have been repealed in the United Kingdom, there is still effective a control of certain exports. In Spain the export control is limited to foodstuffs principally, and in Sweden and Norway to grain and dried calfskins.

As there is apparently in none of the European countries an agreement providing for a voluntary control of all exports, there remains but one group of restrictions—the seventh. These laws provide for a control of exchange required in export transactions. It will be found that one of the countries with a drastic control of exports, Esthonia, also has a law requiring that all foreign currency received in payment for exports must be collected by the Esthonian Bank. This money is held under the control of the government for the use of importers. If, at the expiration of one month the money thus held has not been employed, the merchant is obliged to dispose of it to the Esthonian Bank at the exchange value prevailing on that date. The exportation of Austrian products, whether subject to license or not, is dependent on the approval by the *Devisen Zentrale* of the terms of payment. It is usually required that payment be made in foreign currency, which must be turned over to the *Devisen Zentrale*. Manufacturers of exported goods who require raw materials from abroad are permitted to retain a part of this foreign currency to purchase therewith such raw materials as they require. In Germany, the importation of currency received in payment for export must be effected through the banks. Transfers for one concern amounting to 1,000 marks per day, or 3,000 marks per month need not pass through these institutions. The Italian Government was for a while also trying to overcome its post-war difficulties by requiring that drafts payable in dollars accompany shipping documents as a condition for the release of exports to the United States.

From the foregoing, it is evident that the outstanding features of the European trade restrictions may be easily divided among the seven groups. Summarizing them, they provide either for a complete control of all imports, a partial control of imports, a voluntary control of imports, a control of exchange required in the payment for imports, a complete control of all exports, a partial control of exports, or a control of the exchange required in export transactions. An examination of any of the European systems of trade restrictions in force at the present time would reveal that it is in general constructed on the basis of these fundamental issues.

Specifications for Starting and Lighting Batteries

A CONFERENCE was held at the Bureau of Standards recently to consider a draft of specifications for starting and lighting batteries for military trucks, which had been prepared by the Bureau at the request of the Motor Transport Corps. These specifications, while intended for the Motor Transport Corps particularly, will probably receive wider acceptance in view of the fact that there appear to be no adequate specifications for starting and lighting batteries at the present time.

The conference was called, at the request of the Motor Transport Corps, by the Society of Automotive Engineers, who invited members of the Electrical Equipment Committee of that society, representatives of the manufacturers, members of the American Institute of Electrical Engineers' Committee on Storage Batteries, representa-

tives of the Navy Department, the Bureau of Standards, and the Motor Transport Corps.

The matters discussed included the capacity and arrangement of the batteries; the method of rating them; specification for the construction, quality of materials, and the electrolyte. Tests of the battery were outlined to include measurements of the capacity, the retention of charge, the purity of the electrolyte, life tests and vibration tests.

While the general form of the specifications was agreed upon, together with a satisfactory system of ratings, some details as to dimensions and performance were left for further consideration of sub-committees, and, consequently, it will be some time before the specifications will be ready for publication.

Super-Charger Makes Flight Possible at High Altitudes

The problems of such flight were discussed by Commander Richardson at a recent S. A. E. meeting at Philadelphia. The Navy engineer believes that power loss due to decreased air density may be overcome and that many new instruments would be necessary for such flying.

POSSIBILITIES of flying at high altitudes were discussed by Commander H. C. Richardson, chief engineer of the Philadelphia Naval Aircraft factory, at the monthly meeting of the Society of Automotive Engineers, Pennsylvania Section, at Philadelphia on March 25.

Commander Richardson pointed out that an ordinary engine loses in power as the plane ascends on account of the decreased density of the atmosphere. This loss, however, can be practically eliminated by the use of a super-charger.

As the air density decreases the velocity required for sustentation increases as the square root of the ratio of air densities. The effective horsepower required increases in the same ratio. In other words, if the angle of attack is unchanged, the effective horsepower required increases in direct proportion to the increase in speed. For instance, at an altitude where the density of the air is only half as great as at sea level, the velocity required for sustentation is increased 41.4 per cent and the effective horsepower required to maintain this speed also is 41.4 per cent greater.

Commander Richardson cited the example of a plane fitted with a 400 b.h.p. engine and with a propeller of 75 per cent efficiency. If a supercharger were used, so that the effective horsepower of the engine remained constant for all altitudes, the plane would be capable of a speed of 154 m.p.h. at sea level, 171 m.p.h. at 10,000 ft., 190 m.p.h. at 20,000 ft., 208 m.p.h. at 30,000 ft., and 233 m.p.h. at 40,000 ft. Unfortunately, no simple propeller could be designed to absorb this horsepower under the different conditions of air density, at the normal engine speed. One solution of the problem presented by this condition is the use of a variable pitch propeller and another the use of shift gears. A subterfuge method would be to fit the planes with a propeller much larger than necessary for use at low altitudes but this is objectionable because it cuts down the possible rate of climb.

Results had been calculated for a variable pitch propeller on which experiments had been made in the wind tunnel at Leland Stanford University. A chart was projected on the screen, showing how, with this variable pitch propeller, the maximum propeller efficiency can be maintained substantially constant for a wide range in speed, by changing the setting of the propeller blades from 4 deg. retard, in steps of 4 deg., to 24 deg. advance. A table was given of the engine speed in r.p.m.'s, the propeller efficiency in percentage, the engine horsepower and the effective horsepower at the propeller for five different settings of the propeller, for altitudes of 6560 ft., 14,100 ft., 23,450 ft., 29,500 ft. and 36,900 ft., and for speeds of 62, 93, 124 and 186 m.p.h. at each of the different altitudes.

Commander Richardson predicted that, by the adoption of superchargers and variable pitch propellers, it would

be possible to attain altitudes of 50,000 ft. and travel at a speed of 260 m.p.h. Observations taken during recent altitude flights have established the fact that there is at all times a west wind of about 100 m.p.h. at such altitudes, so that an airplane developing a relative speed of 260 m.p.h. would really be travelling at 360 m.p.h. and could cover the distance from New York to London or Paris in 10 hours.

In such thin atmosphere as is found at over 30,000 ft. altitude, the effects of disturbance upon the airplane are greatly augmented and the best types of instruments, adjusted to work at low temperatures and pressures, must be used. The ordinary magnetic compass goes wild when the plane is turning and loses accuracy if the plane is inclined. The inclinometer also fails to indicate true levels when turning, and as at such altitudes the ground is indistinct and often obscured by clouds, surface indications can no longer be depended upon to determine the true altitude of the plane. The following set of instruments is believed to be necessary for flying at high altitude: A turning indicator with positive action; a highly sensitive compass; a centrifugal inclinometer, a drift meter, a radio compass, the usual instruments showing performance of the power plant; special oxygen equipment and clothing for the pilot and passengers, and increased cooling capacity for the radiating system.

The useful loads that can be carried will be reduced by the extra equipment needed, additional radiating capacity, supercharger gear and the increased weight of a variable pitch propeller or change gears if used.

Considerably higher speeds can be made at the higher altitudes. Thus at sea level the best cruising speed would be about 75 m.p.h.; at 30,000 ft. altitude it would increase to 130 m.p.h. The effective horsepower required would, however, increase from 62 to 106, the effect being that the cruising radius is substantially unchanged. The conclusion is arrived at that while by travelling at high altitudes we may greatly increase the speed of travel, the radius of action will remain substantially the same. In fact, unless the wind at great altitudes favors the direction we desire to take, we shall probably lose, because, while climbing, we must lift a load of gas and oil, thus expending energy to lift a weight that will be consumed in flight and which will not be available to return the equivalent energy in descent.

It appears that the variable propeller is principally useful as a governor at high speed. If it were not for limits to the number of revolutions per minute the basic form of propeller, carefully selected, would give greater effective horsepower than the modifications available in the variable pitch propeller. It also appears more than probable that shift gears would permit a most efficient combination for a specific occasion. Whether or not they should be adopted

will depend upon the possibility of developing and applying such gears without such an increase of weight as would make the net result a handicap instead of an asset.

In the discussion, Commander Richardson made some references to Major Schroeder's recent altitude flight. When starting on the climb, Major Schroeder headed directly west from Dayton; he kept his machine turned in a westerly direction at all times, and at one time got as far west as Indianapolis. However, at the higher altitudes there was a strong west wind, the velocity of which was considerably greater than the speed of the plane, and, when the maximum altitude was reached, Major Schroeder was a considerable distance east of his starting point. At 30,000 ft. the speed of the wind was approximately 100 m.p.h., while the speed of the plane was only 85 m.p.h.

Major Schroeder was overcome by the effect of the cold, became unconscious and fell a distance of about 5 miles, his plane attaining a speed of about 300 m.p.h. during the drop. He regained consciousness just in time to straighten out to prevent a smash, his altitude when the plane

straightened out being only about 300 ft. above the ground.

Commander Richardson was asked what he thought of the possibilities of the helicopter. By way of explanation, it may be stated that a helicopter is a flying machine deriving its lift from two or more propellers on a substantially vertical axis. He said that he had no doubt such a machine could be built and could be made practical if the problem of stability could be solved. What worried him was the question as to what would happen to a helicopter if the power failed. It might be possible to make a helicopter safe under such conditions by making the surfaces reversible so that they would exert a drag on the descending machine. One thing that had to be taken into consideration was that in order to lift one pound with a helicopter a direct thrust of 1 lb. has to be exerted while, with our present type of airplanes, the forward thrust necessary to create a lift of 1 lb. is only from 1/10 to 1/6 lb. Also, the pull of the helicopter screws acts always at the center of gravity of the machine, but not necessarily in a vertical direction.

The Life of an Airplane

THE life of an airplane depends on two distinct assemblies: the power group and the structure of the machine. These have little in common, as far as their life is concerned, and their use requires different methods and usually a different class of mechanic for the upkeep.

Prior to the war the object of the designer was to get a machine that would fly, and little attention was paid to the durability of its parts. During the war it was discovered that the life of a machine in service was about three months, as it either was rendered obsolete or was crashed by the end of that period. This fact led most designers to sacrifice any considerations of durability in order to gain the prime military features of extreme speed and maneuverability.

Many of the larger aeronautical engine manufacturers of the world have remodeled most of their successful types with intention of increasing reliability. This has usually resulted in a slight increase in weight. Also the question of cost of overhauling has been gone into carefully and present-day engines are so designed that their accessories, valve gears, and similar parts are readily gotten at for cleaning and adjustment. The result is that most engines on the market to-day for commercial use can be relied on, with proper use and care, for from 125 to 150 hours without being overhauled. And if hoists, suitable benches, and other shop equipment are not available, valves may be ground and even pistons changed in many modern types without removal from the plane.

As mentioned above, war machines were designed for speed and not for durability. One feature, however, was developed as a result of the war which will have a great effect on the future use and development of aviation. That is the application of metal to the structure of the airplane. The Germans were driven to this by the lack of a reliable supply of suitable lumber. Some French and English firms also worked on this problem, notably Boulton and Paul in England and Louis Clement in France. Many inventors have brought forward alloys, new structural combinations, etc., with the object of using metal in whole or in part.

This development has been foreseen for many years, but presents a difficult problem. The effort to obtain the maximum of strength with the minimum of weight resulted in vastly refined types of internal structure and

thorough investigations into the strength and properties of the available materials. All of this data and knowledge is now available to the designer who is working with the idea of durability.

The great shortage of good linen prompted an investigation of other materials as a substitute. Various weaves of cotton and cotton with linen were developed which have some properties of value that all-linen has not, besides being cheaper. Streamline wire was brought out of the experimental stage and can be obtained of equal strength and reliability with stranded cable.

In Explanation of the Financial Statement

AN educational step of practical value was taken recently by the Eisemann Magneto Corp. when it attempted to explain in language intelligible to the layman, its semi-yearly finance report. The statement was presented in a recent issue of the company's house organ over the signature of W. M. Shaw, president of the company. An attempt was made to explain to the employee just what the various items of the statement mean, together with the significance of the more important ones. While some improvement might be made, the concern has undoubtedly caught a vision of practical employee education.

President McCauley, of the Packard Motor Car Co., attempted something of a similar nature recently, when he addressed the members of the Packard Ten Year Club. He explained the disposition that was made of profit, and showed the necessity for paying a fair return on the capital invested in the corporation.

To the average man, whether a manual worker or not, a financial statement is usually an enigma. Since man inherently fears that which he cannot understand, this interpretation of financial statements by employees has caused much unwarranted discontent and distrust. Consequently, education along these lines has a very definite and practical value. Such education, which will go far toward convincing the employee that all the cards are face up on the table, is likely to convince him that confidence in his employers is not being misplaced.

Trans-African Flight Attempts Reveal Aviation Handicaps

Five planes essayed the 5,200 mile trip from Cairo to Capetown, none finishing the course. Engine troubles, principally due to the cooling systems, and the effect of the tropic heat, caused the flights to fail.

RECENT reports in this country of the outcome of the British attempts to fly across Africa, from Cairo to Capetown, a distance of some 5,200 miles, are interesting as showing the dependability of present-day aerial engines and of plane structures. They also are interesting from their revelations of the effects of altitude and tropic heat upon such cross-country work, these being factors for solution in planning and carrying out lengthy commercial routes such as, for instance, one that might be projected to carry mails between the United States and South American ports.

The African flight ended, unfortunately, in failure, although the Vickers-Vimy *Silver Queen II*, whose engine had flown from England to Cairo before attempting the trip to Capetown, was almost in sight of its goal when it crashed at Bulawayo, on March 7, about 4,100 miles from its northern starting point. Another ship of the same make, flown under direction of the *London Times*, negotiated more than half the cross-African limit, in a difficult trip, made more difficult by leaking water jackets. This plane and engine also had flown from England.

The details last received from London record partially the reasons for the lack of success of the five planes that attempted the trip. Three of them crashed within 600 to 800 miles of Cairo, only the *Silver Queen II* and the *Times* machine proceeding far into the continent. Their experiences are the most illuminating and should be studied by engineers interested in aviation and automotive practice.

The *Times* machine, which carried an independent reporter and newspaper man, has furnished more information of its trip than the leader. The *Times* machine was piloted by Captains Cockerell and Broome. It flew from England to Cairo with but little difficulty and left the latter place with the crew confident of reaching Capetown without difficulty over the route laid out by British fliers and engineers. But shortly afterward, and while flying over the hot desert, the engines, which were of Rolls-Royce design, became overheated, and, before a landing place could be found in the rough country, the cooling water was almost exhausted. The result was the natural one of impairing the cooling system to such an extent that final success became impossible.

Emergency Repairs

The crew, however, was able to rig up an emergency pump and take other measures to overcome the difficulty. The diary of Dr. P. Chalmers Mitchell, the *Times* observer, for the remainder of the trip is filled with references to the leaking jackets and to the attempts to rectify it. But the crew could not carry out the necessary repairs. At Kisumu, on Lake Victoria, about half-way to Capetown, the fliers believed they could get new engines and they pushed on to that point. But the engines were not available, reports saying cryptically that "they had

been immersed in salt water," probably in shipment, and so it was necessary to continue from there with the old leaky units.

Many difficulties already had been surmounted. Several forced landings in the rough country were necessitated, in which the fliers were exposed to fevers, wild animals, and even hostile natives, and long waits before restarting subjected the men to many privations and hardships. The heated air and the altitudes caused trouble at numerous times in getting off the fields and accidents from that cause were narrowly averted, it was reported.

From Kisumu they made only the short distance to Tabora, about 2700 miles from Cairo, where the big plane crashed in attempting to get off the field to make the next leg. Doctor Mitchell reported the accident as "due to leakage in the induction coils," and the smash made it impossible to continue further.

Engine Cooling in the Tropics

Writing in the *London Times* recently, C. Johnson, managing director of the Rolls-Royce company, stated that the plane should not have continued after its trouble below Cairo. His comments on the cooling system were:

"The point for solution is why the engines heated. It may be that, when all the necessary information has been received, a simple answer to this question may be found. It may be that means taken to cool engines in northern climes, or which may be suitable for flying at high altitudes in hot countries, are insufficient for flying with heavy loads at low altitudes under the climatic conditions of the Cairo-Cape route. Cooling an engine when flying low over hot desert sand is a different problem from cooling an engine at 10,000 ft."

Mr. Johnson added that, since the armistice, Rolls-Royce engines have flown more than 134,000 miles without cylinder leakage trouble. He expressed confidence that such difficulties would not occur often.

"The planes, propellers and controls gave no trouble," Doctor Mitchell wrote. "The passengers' seating, the position of the windows and the accommodations of spare parts and food supplies require consideration. The morning cold makes a rug for the feet requisite; otherwise extra clothing is unnecessary. The existing arrangements for ventilation are sufficient, even during the great heat."

In considering the flight, the varying conditions met with must be considered. Part of the trip was over desert, much of it was above jungles, swamp and brush, and a great part was at high altitudes. Great heat was encountered and at one time Mitchell declared that certain conditions made large wing surfaces necessary. Much of the flying was close to the ground, power being insufficient to lift the machine through the heated air, and this added to the dangers of enforced landings.

Many details concerning the trip of the *Silver Queen II*,

which was piloted by Lieutenant-Colonel van Ryneveld, a South African, have not been received, the most definite having been a message to the Rolls-Royce company saying the crash was due "to taking off with overload at high altitude" of the Bulawayo airdrome. Ryneveld, in his flight from England to Cairo, suffered from storms and gales and his machine was severely battered in the long trip across the Mediterranean, in which his time was only two hours less than that of Alcock and Brown across the Atlantic.

To Cairo van Ryneveld flew in the *Silver Queen I*. It was crashed, however, at Korosko, just below Assuan, near Cairo. The engines were salvaged, returned to Cairo, and, after an overhaul, were placed in the *Silver Queen II*, in which the flight was made to Bulawayo. Throughout this trip, the pilot reported little engine trouble and, at Bulawayo, stated that he hoped to obtain another plane into which the same powerplant might be installed for continuing the trip.

The *Silver Queen II* seems to have had its greatest difficulties because of the altitudes and the heavy heat. Below Mongalla, at an altitude of 7,000 to 8,000 ft., the plane met innumerable whirlwinds caused by the terrific ground heat. "The machine was thrown about in a most

uncomfortable manner," it was reported. "At Abercorn," the report continues, "the highest landing place on the route, the fliers had to discard everything not absolutely essential in order to leave the ground at all. Heat and altitude made both landing and taking-off matters of difficulty and anxiety."

Of the other planes that made the attempt, a Handley-Page was crashed at Shereik, on Feb. 26, the smash having been caused "by an accident to the plane structure." The other machine, the *Silver Queen I* being considered the fifth, was a Vickers-Vimy R. A. F. plane that had a forced landing at Korosko.

English newspapers and technical papers have been reviewing the flight attempts since the unfortunate crash of the van Ryneveld machine. The comments, which showed in a measure the hopes of the British that a successful aerial line might be established across the African continent, were almost a unit in saying that commercialization of the route would necessitate relay flights, the mails and passengers to be transferred from plane to plane at the intermediary points. The route, because of the British influence and dominions in Africa, is an important one to that country and direct communication between the north and the south, of course, is slow and backward.

The Junker Metal Airplanes

SOME information concerning the metal airplanes designed by the Junker firm in Germany has been issued by the Technical Department of the British Air Ministry through *The Aeroplane and Flight*. These machines are of great interest to all connected with aviation, not only because of their metal construction, but also because of their other design features.

Two models are described: an armored two-seater biplane, type J-1, and a single-seater pursuit monoplane, type D-1. Both are constructed entirely of metal and have cantilever wings. This firm has also produced a commercial six-seater cabin monoplane, which has been illustrated in the daily papers. Its construction is undoubtedly similar.

The wings have a deep section with a thick, round leading edge. This is also probably a "high lift" section and is in accord with general German and Fokker practice. They do not have spars, as the term is generally understood, but have a rather large number of tubes running along the wing. In both types these tubes support the top and bottom surfaces. The biplane has ten such tubes in the upper wing and six in the lower. With the exception of two in each wing, they are arranged in pairs, that is to say one under the top surface of the wing over one on the lower surface. They are braced to each other within the wing by smaller tubes in such a way as to form a Warren truss between any two spar tubes. In the monoplane there are seven spar tubes, not in pairs, but evenly spaced when viewed from above; the bracing is the same. This construction appears to have sufficient strength to carry the bending moments due to the cantilever design.

The fuselage of the biplane is made in two parts: an armor box containing the crew and engine, and a tail section built up of duralumin tubes in the form of a box girder and cloth covered. The pilot is under the center section and a square hole is cut in the upper wing for him to see through. The landing gear and center sections with their struts form a unit. The struts at the center section are the only ones on the machine. There is one pair on each side sloping outward and running from the lower wing roots to the upper center section. They are braced by another pair on each side, which cross to make an X and have

the same fitting at the upper plane as the first pair. At their base they join the fuselage.

The metal used both for bracing and covering is duralumin. The covering of the wings is corrugated with the grooves running parallel to the line of flight. The sheet used for wing covering on the biplane is 0.015 in. thick and weighs 3.65 oz. per sq. ft. On the monoplane it is 0.014 in. thick. The bracing is of the same material, but steel is used generally for fittings.

The brief specifications of these two machines are:

D-1: Type, single-seater, pursuit monoplane; engine, 160-hp. Mercedes; span, 29 ft. 2 in.; length, overall, 22 ft.; total wing area, 158.8 sq. ft.; speed, 140 m.p.h.

J-1: Type, two-seater, armored biplane; engine, 230-hp. Benz; span, top 55 ft., bottom 35 ft. 7 in.; length, overall, 29 ft. 8 in.; height, overall, 11 ft. 9 in.; weight, empty, 3724 lb.; useful load, 845 lb.; wing loading, 8.5 lb. per sq. ft.; power loading, 19.9 lb. per hp.

Conditions of the Dutch Automobile Industry

THE automobile parts industry in Holland showed increased activity during the last half of 1919, according to an official report. Automobile and body factories also are gradually obtaining more work. There is a steady demand, especially for bodies, but the high prices result in much business going to the United States. As regards the supply of raw materials, the situation has improved materially, yet export business is still rather quiescent, especially as regards bodies for new chassis, which latter must be obtained outside the country. There is general complaint regarding the low productivity of the workmen and the lack of skilled labor. It is expected that in the near future the demand will exceed the supply, as, in view the reduced working hours and the scarcity of skilled labor, production has materially decreased. The manufacture of motorcycles is increasing considerably. A difficulty met with in this line is that the Dutch foundries cannot do the foundry work on complicated motor parts as perfectly as foundries in other countries.

European Labor Indicates a Slow Return to Normal Production

Leaving Belgium out of the consideration, Mr. Tipper sees few prospects for an immediate active competition by Continental factories with those of America. One reason for such a declaration is the political activities of the labor groups in the old countries. This brief study, however, takes up other phases of the complicated European situation.

By Harry Tipper

THERE is nothing in the European labor situation which would presage the return of European countries for some time to active competition with the United States in prices and ability to deliver. The power of the workers' organizations in these countries is much greater than it is in the United States, and the industrial troubles are so intimately connected with the political situation that they cannot be reviewed separately. In addition to the fact that the aspirations of the working class have been augmented by the better economic conditions operating during the war, there is a class solidarity among the workers, due to the marked class distinction, which gives a serious aspect to the continuance of labor trouble and political difficulty on economic matters.

In our calculations upon the return to normal production and the usual flow of trade, we are constantly forgetting the effect of five years' interruption of the orderly process of peace-time production. Especially is this so in matters relating to the social surroundings, to the necessities, such as housing, furniture, household equipment, shoes, clothing and to other matters in which a normal continual growth of production is required each year in order to satisfy the needs of a growing population. We have been feeling the disturbance and the scarcity of products in the United States, due to about a year and a half of actual war activity. This disturbance is small in comparison with the difficulties encountered in the Allied and enemy countries of Europe, after four years of conflict, in which the whole life of the nations became absorbed in war and war necessities, and all production development except that which belonged to war was practically eliminated. To this disturbance and this scarcity of product must be added the reactions due to the long continued concentration upon the conflict and its abrupt ending, together with the labor conditions which arise partly out of the larger power of labor and partly out of the reaction from the strain of war. This actual dropping behind by the cessation of peace production activity, forms the background for the uncertain conditions in Europe to-day.

Contrary to our general opinion, which assumed that German workers were operating on longer hours and on large production schedules, recent information indicates that the production per man per hour has decreased to a considerable extent in that country, and that the workers are not actually laboring on the longer hour schedule.

In France, the activities of the central organization of labor and the operations of the extreme Socialists have served to keep the brakes on the return of industry to its maximum volume, and it is evident that unrest is an important factor in Italy.

In Great Britain the economic situation continues to be of the foremost political importance, and the complete organization of skilled and unskilled labor is being followed by the rapid organization of clerks, draftsmen, professional workers and others of the salaried class. The extent to which this organization of the black coated workers, as they are called, will affect the situation cannot be determined until they have developed more fully and have outlined their relation with the trade unions.

All labor is so intensely interested in the political question that active campaigns are being conducted by the labor unions themselves for public support of Parliamentary measures which will agree with the program of the Labor Party. In the meantime, the wage decisions do not indicate any reduction in wages; rather the tendency of recent settlements has been further to increase wages. There does not seem to be any inclination on the part of the unions to accept piece-work rates, with the exception of the metal trades industries, where there is some disposition to consider such labor under certain safeguards. In the meantime, the trade unions are working their machinery so as to permit more effective control from the central federated bodies, the new unions among the salaried workers are increasing and experiments in new co-operative movements are taking place.

We have heard a great deal in the United States about the operation of the Whitley Councils, and a good deal of propaganda has gone out with the idea of suggesting something similar for this country. It is interesting to note that the Whitley Councils are not meeting with favor in all districts. In some cases they have been discarded for the old method of dealing directly with the trade unions. In other cases, their decisions are not being adhered to entirely, and there is no evidence that this machinery will be retained or will become an important part of the industrial organization of Great Britain.

An interesting experiment has been suggested in Manchester, which is in the heart of the original co-operative

society district. This experiment has been suggested by the Building Trades Workers and is a return to the old Guild System in which the craftsmen produced the product and marketed it through the Guild.

They have made a proposal to construct houses at 10 per cent gross profit and claim that a saving would be effected. Under ordinary circumstances, this suggestion would not be important but that particular district in Great Britain has shown its capacity for co-operative organization in the past 50 years and no one who has noticed the enormous warehouses along the Manchester Ship Canal, owned by the workers' co-operative societies, can be sure of the failure of this newer experiment, provided it gets a fair opportunity to try itself.

The history of the Guild System is quite interesting in itself and might be worthy of comment at a later date if these experiments justify themselves. The fact that the suggestion has been made and has been received seriously by the Manchester City Council, is indicative of the homogeneous character of the people and the way in which the political and industrial conditions affect the whole approach to the subject of industrial relations.

We have stated from time to time that the question of labor cannot be divorced from the questions usually understood to apply to the social organization. In Great Britain the subjects are so closely allied in the political activities of the labor party that it is utterly impossible to consider the industrial situation without dealing with the social conditions at the same time. It must be remembered that most of the manufacturing centers of Great Britain are located in a climate where there is a large preponderance of gray or cloudy days, where the winter day is very short, and the fog and smoke make it necessary to use artificial light during the majority of days, at least three months in the year.

The housing conditions in these manufacturing cities have not been of the character we would consider suitable for industrial workers in this country. Old methods of building and sanitation obtained right up to the war in most of these centers and the economic position of the worker did not permit of any large amount of com-

fort or any luxury in his social surroundings. Building was stopped during the war, except as it was required by the government for war purposes and that means that Great Britain is five years behind in building.

We know something about the shortage of houses in this country, where we are less than two years behind through the war requirements. The situation is far more acute in Great Britain where the lack of building for five years has left them short hundreds of thousands of houses for the working population. If these facts are taken in conjunction with the complete organization of workers through their trade unions, the solidarity as a class and the definition of their aims as a political party, the difficulty of getting into production and back to normal working conditions in Great Britain will be appreciated, to some extent at least.

The recent by-elections indicate that the Labor Party is accumulating political strength and it seems not all together unlikely that the dominant power in British politics in the near future would be the labor group. In this case it is to be expected that the political aim of the Labor Party will take precedence over the question of production and in fact it does not seem likely that production can be greatly improved in that country until some of the political questions have been brought before the public and distinctly settled.

As a matter of fact, in all the industrial countries of Europe production will wait to some extent upon political decision. The situation is continually improving, of course, more people are working and more people are staying at work but production on the continuous and definite basis exhibited before the war is not in sight and is not likely to be in sight until some of the acute political questions have been decided.

This does not apply to Belgium, where the suffering of the people under the dominance of the German occupation for several years have had their effect in a unit of desire for the rehabilitation of the country. Such a unity is not exhibited in any other European country.

Prospects for British Automotive Industries

IN the view of a British automobile expert, reported by the American Chamber of Commerce in London, any contrast of the American and British automotive industries is primarily affected by the fundamental difference in the respective home markets. This report, says the Chamber, claims that the unprecedented demand for cars by the American public assures America's market, so that the American industry is justified in embarking on a scale of production that would mean financial suicide for the British manufacturer.

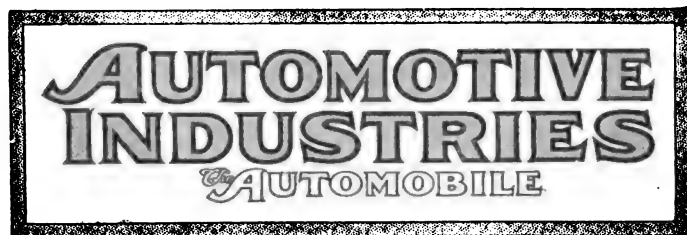
Owing to the scale of production required to meet the home demand, the United States manufacturer, it is said, can in addition produce at such a price as to insure practically 90 per cent of the world's export market for his output. Therefore, as Britain cannot produce cars to compete on cost in the world's markets, the only thing left to the British manufacturer is believed to be in the matter of better design.

But even this stage has not been reached in the British industry, the American Chamber points out. Remarkable efforts will be needed before the British manufacturer can lead America in design, for the reason that during the past five years the American industry has set itself to

study design and to embody all that is necessary of such knowledge in its own practice.

The writer contends therefore, says the Chamber, that it is necessary for the British industry to break away from conventional practice if it desires success. For example, if the proposed taxation of passenger vehicles in Britain is based on weight, then a great premium would be placed on designing passenger cars which would be notably light for their accommodation and powers of performance, and quite distinctive from what it would pay the American industry to produce. In this way only, it is claimed, Britain might hope to obtain in the world's market, for products of such exclusive character, the price necessary to ask for them in face of heavy taxation and labor charges.

WITH a view to reducing difficulties connected with pulley sizes and to assist the farmer in operating his ensilage cutters, manufacturers of ensilage machinery have advocated the use of two-belt speeds on their machines—speeds of 2600 and 3000 ft. per minute. This action was taken at a recent meeting of the Ensilage Machinery Department of the National Implement & Vehicle Association at Chicago.



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Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907, and The Horseless Age (semi-monthly) May, 1908.

State Industrial Laws and Production

STATE industrial laws are not the most interesting reading in the world and they are not always of instructive value. It is not surprising, therefore, that some laws which might be of aid to the manufacturer, even in actually increasing his production, are not carefully studied. At a time when satisfactory foundry production and turnover seems particularly difficult to obtain, the state laws regarding this phase of industry are of special interest.

Progressive employers are showing an interest in industrial laws as constructive aids to business, not merely as task-masters for managements. The Employers' Association of Detroit has issued a small pamphlet, well indexed and attractively prepared, of the Michigan State Labor Laws. In these, as well as in the labor laws of New York and several other states, are contained provisions concerning foundry conditions that might help the manufacturer in solving his problems.

Too often executives have been content to say, "Well, the foundry is necessarily a dirty and un-

pleasant place; you can't do much about it." The successful foundries which have been able "to do something about it" and thereby increase production are too well established to allow any doubt as to their success. Many of them have found it a profitable business proposition to go far beyond the requirements of state laws in improving working conditions.

Simply fulfilling in every particular the spirit as well as the letter of laws regarding foundries, however, would vastly improve conditions in a number of automotive plants. The foundry laws in one state, for instance, include this provision: "Whenever a foundry is so constructed or operated that smoke, steam, dust or noxious gases are not promptly carried off by the general ventilation, exhaust fans shall be provided."

This provision evidently implies the actual carrying off of such gases and dust, not merely the installation of fans. One factory advertising manager stated recently that the air in the foundry of his plant was changed five times every hour; the picture he painted of conditions was a glowing one. A visit to that foundry proved that it was impossible during much of the operating time to recognize a man clearly at a distance of twenty-five feet, and that a deep breath was not pleasant in that atmosphere.

Tractor Shows and Parts Makers

IN accordance with a decision of the National Implement and Vehicle Association, four national tractor shows will be held next winter to take the place of the single national show at Kansas City. This solution of the problem was predicted in AUTOMOTIVE INDUSTRIES and seems to be in accord with the wishes of the large tractor makers, who realize the impossibility of drawing dealers from all over the country to a single center. None of the four exhibition cities has been selected, or at least none has been officially announced, but it is a safe guess that Minneapolis and Kansas City will be included in the list. The South is making a bid for one of the shows and may land it, and the fourth no doubt will be held either at Chicago or in some city east of Chicago. In the early discussion of the situation the suggestion was made that one show be held on the Pacific Coast, but, owing to the distance from the centers of tractor production and the limited possibilities for immediate development there, the plan did not seem to meet with much favor.

One large and rather important section of exhibitors at the tractor shows seems to be receiving scant consideration in planning these shows. We are referring to the manufacturers of components such as engines, transmissions, wheels, magnetos, carbureters, air cleaners, radiators, etc. At the recent Kansas City show the list of these equipment exhibitors numbered close to one hundred. A great many of them do business with manufacturers only, and they participate in tractor shows to meet the tractor makers. Naturally, they will not go to all four of the national shows, as that would be a waste of effort. The most accessible show will be selected

by the parts makers, and if Chicago should get one of them there is little doubt but that most of the parts makers would exhibit there. It would be preferable from every viewpoint to make one of them the official parts show, so that the bulk of the products of the tractor parts industry could be seen in one place rather than to have the parts exhibits divided up among the four exhibitions. We cannot expect the N. I. & V. A. to take any action to this end, but the Motor and Accessory Manufacturers' Association might do so.

The Business of Government

THE need of a business government for the United States probably will never be more concisely put before the public than in this statement by the chairman of the House Appropriations Committee; the Hon. James W. Good, has recently made the following statement:

"To-day duplication in the Government service abounds on every hand. For example, eight different departments of the Government, with large overhead organizations, are engaged in engineering work in navigation, irrigation and drainage; eleven different bureaus are engaged in engineering research; twelve different organizations are engaged in road construction; while twelve, with large overhead organizations, are engaged in hydraulic construction, and sixteen are engaged in surveying and mapping. Sixteen different bureaus exercise jurisdiction over water-power development. Nine different organizations are collecting information on the consumption of coal. Forty-two different organizations, with overhead expenses, are dealing with the question of public health. The Treasury Department, the War Department, the Interior Department and the Department of Labor each has a bureau dealing with the question of general education. These departments operate independently; instances of co-operation between them are exceptional. Each of these departments is manned at all times with an organization prepared to carry the peak of the load, and maintains an expensively ready-to-serve personnel. A lack of co-operation in the executive departments necessarily leads to gross extravagance."

Metric System Propaganda

A FEW days ago the American Institute of Weights and Measures learned that a bill had been prepared for submission to Congress to establish, within a limited time, the metric system as the standard of measures in this country and for foreign trade. This bill, as prepared, was ruthless in its requirements as to dates when the change should become effective. Representatives of the Institute persuaded the Representative who was to sponsor the bill to delay its introduction for a short time. In the meantime, the Institute has begun an active campaign against such action.

The metric system campaign is illustrative of the possibility of the influence of one person in this great

government of ours. Also, it illustrates how easily this same person may become an international factor, as the campaign is almost as well advanced in Great Britain as it is in this country.

Apparently the campaign is sponsored by the "World Trade Club" of San Francisco. But this club, according to responsible investigators, consists of one man who is personally drafting the leaflets and petitions sent broadcast and who, at last reports, was paying all of the bills. It is said that this man paid \$80,000 for one issue of circulars and that he has expended about \$500,000 to date in furthering this personal hobby. He has asked for no financial assistance, appearing to spend his money as suits him.

But the situation is becoming serious. It is time that manufacturers were taking stock and looking to their own interests before this mysterious individual forces them to junk their machinery and shop practices and forces them to reform all current practices. The testimony of engineers and mechanics who have worked under metric and inch systems is not all in favor of the metric system. Manufacturers should give some serious thought to this situation and act according to their convictions. AUTOMOTIVE INDUSTRIES is quite certain that such action will not aid the propaganda of the San Francisco propagandist. If you want to study the situation, the American Institute of Weights and Measures at 20 Vesey Street, New York, will be pleased to supply literature.

Foreign Languages

A RECENT report of the Bureau of Commerce stated that a New York exporting house got into legal difficulties in Belgium because of charges that certain goods shipped by the firm to that country had been adulterated. The threat, which was directed against a company official who was visiting in Belgium, was made under a provision of the criminal law relating to obtaining money under false pretences, and the American was almost put into jail. However, it was claimed that the misunderstanding grew out of a mistake in translation and because of the shipper's knowledge of the French language.

The fact that the goods were not what had been expected and that the company placed itself liable to criminal proceedings is important in that it shows the exporters went about their sale without full knowledge. But the more important phase is that the company claimed ignorance of the French language and admitted that ignorance somewhat as a matter of course.

Much has been written and many warnings have been issued by official and semi-official trade organizations about this particular danger. Exporters have been urged to exercise care in the employment of translators and they have been told that they must not do business with a foreign country, especially if the language is different, in a haphazard manner.

But it seems as though the lesson had not been learned everywhere and that some companies at least have not gone into the export field with that full and complete knowledge and effort so characteristic of business dealings at home.

February Exports Create New Marks

Cars, Trucks, Engines and Parts
Show Large Gains—Britain
Leads Consumers

WASHINGTON, March 26—Another vast increase in automotive exports is displayed in the figures just made public by the Bureau of Foreign and Domestic Commerce, for February, 1920.

Passenger car exports for February totaled 11,221, values at \$11,604,622, as compared with 7870 cars worth \$8,846,900 shipped in January of this year and as against 3041 cars valued at \$3,719,485 exported in February of 1919.

Exports of motor trucks were likewise in great excess over past figures. Shipments for February, 1920, totaled 2889, valued at \$4,130,468, as compared with 1721 trucks worth \$2,727,856 shipped in January, 1920, and as against 1403 trucks worth \$4,270,542 exported in February, 1919.

Motorcycle exports and parts exports showed similar increases. The shipment of parts, not including engines and tires, totaled \$7,207,366 for February, 1920, as against \$2,699,839 in February, 1919.

Automobile gas engines, marine gas engines and stationary gas engines showed similar increases, while tractor gas engines showed a decrease as against past figures, there being but 1371 tractor gas engines exported at a value of \$1,251,547 in February, 1920, as against 1706 worth at \$1,500,965 in January, 1920, and against 2245 valued at \$2,145,152 in February, 1919.

The United Kingdom was the largest single consumer, taking 1864 passenger cars at \$1,963,649 and 410 trucks worth \$723,433. Brazil was the second largest purchaser of passenger cars with 1037 valued at \$709,184. Brazil was an unusually heavy buyer last month when 400 passenger cars were exported to that country. British India likewise showed a huge gain with purchases from that country of 941 passenger cars valued at \$1,073,900; New Zealand with 903 cars at \$1,025,587; Canada with 805 cars worth \$921,168. Australia, Cuba, Uruguay, Spain, British Africa, and Denmark were next in the order named.

The figures are shown on this page.

Exports of Automobiles, Airplanes, Trucks, Farm Tractors, Motorcycles and Parts for February and Seven Previous Months

	Cars		Trucks		Motorcycles		Parts	
	No.	Value	No.	Value	No.	Value	No.	Value
1920								
February....	11,221	\$11,604,622	2,889	\$4,130,468	3,449	\$920,403		\$7,207,366
January.....	7,870	8,846,900	1,721	2,727,856	2,398	664,288		4,778,626
1919								
February....	3,041	3,719,485	1,403	4,270,542	1,298	283,867		2,699,839

	February 1919		February 1920		Eight Months Ending February 1919		Eight Months Ending February 1920	
	No.	Value	No.	Value	No.	Value	No.	Value
Airplanes	2	\$15,000	3	\$44,000	43	\$577,600	39	\$206,480
Airplane parts		329,129		6,494		9,546,241		221,760
Commercial cars	1,403	4,270,542	2,889	4,130,468	7,721	21,307,605	12,675	23,687,512
Motorcycles	1,298	283,867	3,449	920,403	5,539	1,302,633	19,814	5,433,794
Passenger cars	3,041	3,719,485	11,221	11,604,622	19,523	22,333,972	59,290	63,997,450
Parts, not including engines and tires		2,699,839		7,207,366		22,451,246		34,674,019

Exports of Engines

	February 1919		February 1920		Eight Months Ending February 1919		Eight Months Ending February 1920	
	No.	Value	No.	Value	No.	Value	No.	Value
Automobile, gas.....	551	\$103,219	3,315	\$488,421	15,754	\$2,470,796	24,182	\$3,634,090
Marine, gas.....	457	315,085	550	245,504	3,784	2,102,448	5,889	2,158,090
Stationary, gas.....	1,598	255,538	1,905	308,234	15,153	2,163,037	17,467	2,405,216
Tractor, gas.....	2,245	2,145,152	1,371	1,251,547	14,568	16,169,936	11,574	10,395,496
Total.....	4,851	2,818,994	7,141	2,293,706	49,259	22,906,217	59,112	18,592,892

Exports of Cars and Trucks by Countries

	February, 1920		February, 1920		Eight Months Ending Feb., 1920		Eight Months Ending Feb., 1920	
	Cars	Trucks	Cars	Trucks	Cars	Trucks	Cars	Trucks
	No.	Value	No.	Value	No.	Value	No.	Value
Denmark	317	\$328,004	96	\$208,662	1,940	\$2,221,891	548	\$1,192,214
France	87	133,637	80	261,622	672	928,337	1,362	5,784,463
Norway	109	135,282	98	163,200	1,452	1,826,205	582	1,134,153
Sweden	105	141,540			1,631	2,230,249		
Spain	329	446,921			1,417	1,815,469		
United Kingdom.....	1,864	1,963,649	410	723,433	8,681	9,225,857	1,839	2,868,974
Canada	805	921,168	158	265,398	5,703	6,729,564	1,276	2,135,594
Mexico	245	172,060	94	123,754	1,926	1,571,167	674	813,654
Cuba	421	389,703	186	346,401	2,370	2,386,969	774	1,601,628
Argentina	237	245,319	15	35,708	1,592	1,887,681	117	209,391
Chile	72	104,814			191	291,478		
Uruguay	415	361,188			1,484	1,372,162		
British India.....	941	1,073,900			3,065	3,368,740		
Dutch East Indies....	142	193,767	101	219,002	977	1,235,607	305	653,134
Japan	212	165,532	140	80,125	1,535	1,444,498	459	492,457
Australia	520	596,450			2,807	3,046,092		
New Zealand.....	903	1,025,587			3,228	3,629,535		
Philippine Islands....	102	133,795	19	36,851	1,460	1,605,537	383	563,508
British South Africa...	387	438,823			2,683	3,003,434		
Brazil	1,037	709,184			3,716	2,784,474		
Peru	148	154,689			545	483,734		
China	45	73,187	18	27,269	494	659,422	119	297,466
Other countries.....	1,788	1,696,423	1,207	1,238,862	9,721	10,249,438	3,582	4,890,958
Total.....	11,221	11,604,622	2,889	4,130,468	59,290	63,997,450	12,675	23,687,512
British Oceania.....			267	400,181			655	1,050,008

Foreign Opportunities

WASHINGTON, March 27—The Bureau of Foreign and Domestic Commerce, Department of Commerce, has received requests for automobiles or parts agencies of business from individuals and companies in foreign countries. These are listed below. For further information address the Bureau of Foreign and Domestic Commerce and specify the Foreign Trade Opportunity Number.

An importing firm in France desires to secure representation of firms for the sale of automobile supplies. References. 32337.

An agency is desired by a man in France for the sale of the device commonly known as "motor wheel" to be attached to a bicycle, transforming it into a motorcycle. Quotations should be given c.i.f., French port. Correspondence may be in English. 32341.

A firm of importers in Syria desires to be placed in communication with exporters of all kinds of automobiles and trucks. 32349.

A company in England desires to secure an agency for the sale in India and China of motor cars. Quotations should be given f. o. b. New York. Payment in United States under letter of credit

against documents. Reference. 32352.

A firm of commission agents in Argentina is interested in securing agencies for manufacturers of automobiles. Correspondence should be in Spanish. References. 32355.

A merchant in Syria desires to secure an agency for the sale of automobiles, such as touring cars, passenger cars, roadsters, runabouts and trucks. References. 32374.

A motor car company in England desires to purchase low-priced motor cars and trucks. Quotations should be given c.i.f. Liverpool. Payment by credit in New York. References. 32375.

To Start Lakes Air Service May 1

**Former Aviation Officers to
Operate Fleets Between
Great Lakes Cities**

DETROIT, March 26—The United States Aerial Express will start commercial service between Detroit and Cleveland May 1. Two Curtiss seaplanes will be put on regular schedule, and the company plans a similar service between Detroit and Toronto, and Detroit and Buffalo with two planes each, the latter to start June 1, and the Toronto line about June 15.

The company is headed by Thomas F. Dunn, a former army aviation officer, and Jean Servantie, of the French Flying Corps.

In addition to the two plane units operating between Detroit and the three lake cities there will be one through line, which will touch at all four cities, and which is designed primarily to care for overloads, or to pick up traffic in the event of interruption to one of the direct units operating between two cities.

In addition to the planes operated in the commercial field there will be ten planes distributed at Cleveland, Detroit, Buffalo, Put-in-Bay, Port Huron, Toronto and Toledo for novelty purposes by the company.

Although nothing can be given out definitely the company is said to be assured of the mail contract between Detroit and Cleveland, and the planes will be equipped to carry mail and passenger baggage, making the trip to Cleveland in about 75 minutes. It is the plan to make the 75 minute schedule take a passenger from a hotel in Detroit to the center of Cleveland. The planes, of course, will start and stop in the river and lake, and passengers will be taken out in a dinghy.

In addition to the passenger service a night express service will be maintained for carrying registered mail, clearing house receipts and other important matter. The express planes will be capable of carrying 5000 pounds. The planes which are so equipped that they can make from 50 to 60 miles an hour on the water are 105 ft. spread.

Commercial Possibilities Great

Lieut. Dunn said to-day the passenger rate had not been definitely fixed. Business men enthusiastic over the proposition from its commercial advantages have urged a high rate, in order to minimize the traffic that doubtless will be attracted. The schedule calls for one round trip each day in either direction, but it is possible to make eight, Dunn said, if patronage demands.

The company will operate throughout the year, the planes being equipped to land or travel on ice, as well as water. Absolute safety to passengers is assured, and the cabins are so constructed that they are as nearly sound proof as possible. They are carpeted, well ventilated and equipped with electric lights, the

hull construction being such that a forced landing even on the ground would hardly shock the passenger, though it might ruin the hull.

Dunn, who has been active in aviation circles in Detroit since the armistice, has made the trip in a small battle plane, and has taken scores of business men on hurried business trips to Cleveland during the last few months.

Agree to Lengthen Hours

ANDERSON, IND., March 26—Officials and employees of the Remy electric division of General Motors Corp. have agreed upon a schedule of longer working hours to increase production for the company and better wages for the employees. About 4000 men and women employees entered into the agreement. The new system replaces the two-shift plan alternating between day and night turns on an eight-hour basis. The rotating shift plan, which was an experiment, was said to be unsatisfactory to both management and employees.

Under the new system a small night force will be retained for repairs and special work, and employees will have the choice of an hour for luncheon on their own time, or a short period off with pay. Those taking advantage of the latter plan will draw ten hours' pay. All of the employees will be off duty after 12.15 on Saturdays. The same system, which is in operation at the plant of the American Steel & Wire Co., has been working satisfactorily.

Rolls-Royce Production Delayed Until Fall

SPRINGFIELD, MASS., March 30—Offices of the Rolls-Royce Co., which acquired the East Springfield plant of the Wire Wheel Corp. of America, last December, are to be located at the plant after April 1. Pending alterations, temporary offices have been occupied in this city.

Treasurer H. C. Beaver of the corporation states that the Government has already vacated a large part of the East Springfield plant and that the Rolls-Royce machine tool equipment is being installed for the manufacture of sundry small tools to be used later in the manufacture of the Rolls-Royce automobile. Raw material for manufacture is also being received.

Though the officials hope to begin the manufacture of auto chassis in about six weeks, it is not expected to complete the manufacture and assembling of any of the cars before fall. The entire car is to be built at the local plant. Between 100 and 150 are now employed at the plant. Increase to at least 1000 by fall is expected.

15,000 Automobiles Await Car Service

**N.A.C.C. Committee Presents
Need for Immediate Facilities
to Railroad Heads**

NEW YORK, March 30—Strong arguments which it is hoped will produce a more adequate supply of cars for the automotive industry have been presented to the Car Service Commission in Washington by the Traffic Department of the N. A. C. C. It has been pointed out that the next three months constitute the heaviest shipping season of the year.

There now are stored more than 15,000 automobiles and trucks in the Michigan-Toledo zone awaiting shipment. This represents approximately \$21,000,000 borrowed to finance this business pending shipment and delivery.

The traffic department has made these recommendations:

That car service rules be augmented to require that all automobile cars, until further notice, must be forwarded at once to Ohio, Indiana and Michigan, empty, unless loads to destinations in those States are immediately available: this is not to be construed as interfering with the loading of cars with automobiles at points outside of Ohio, Indiana and Michigan to any destinations so long as car service rules are observed in the routing of such loads.

That reports to the car service section be required of Eastern, Southern and Western roads to show compliance with this order.

That home routing of cars used for the shipping of automobiles or trucks will be required of automobile shippers.

That the Michigan Central, Pere Marquette, Wabash, Grand Trunk and New York Central keep a daily record showing the number of carloads of automobiles delivered their principal Western and Southern connections and the number of automobile cars received from those same connections.

That the car service section at once assign a representative to be located at Detroit to observe the compliance with the rules, to receive reports from railroads and shippers and to assist in the administration of the plan.

M.A.M.A. SEEKS TAX REVISION

NEW YORK, March 28—The Motor and Accessory Manufacturers' Association has joined the Business Men's National Tax Committee and will lend its aid to efforts which are under way to bring about revision of the Federal tax system. The committee will urge upon Congress prompt repeal of the excess profits tax as well as revenue and stamp taxes. It proposes as a substitute a gross sales or turnover tax as well as a graduated personal income tax with an increase in personal exemptions. The subject will be considered at the meeting of the Chamber of Commerce of the United States at Atlantic City next month.

General Purchases Demonstration Site

Will Show Tractors and Farm Equipment on Old Jersey Fair Grounds

NEW YORK, March 27—General Motors Corporation has bought the Monmouth County Fair Grounds, at Red Bank, N. J., as a site for a demonstration and distributing plant for tractors, electrical devices and lighting plants adapted for farm and rural residences.

The property consists of 60 acres and is located on both the Pennsylvania and Jersey Central railroads, just north of the Red Bank station. The grandstand, stables and frame buildings now on the property will be razed to make way for the demonstration buildings.

Among other buildings to be erected will be a complete model farmhouse, equipped with a "Sunnyhome" electric light and power plant, one of the corporation's products. William C. Durant, president of General Motors, whose summer home at Deal Beach is just a few miles south of the new property, will give its development his personal supervision.

The manner in which the demonstrations will be carried out has not been fully determined, according to W. W. Murphy, secretary to President Durant. It will take some time to get the property into the desired condition, and until that time plans will be somewhat indefinite.

CLUB TO FEATURE AVIATION

DETROIT, March 27—Temporary directors of the Aviation Country Club, the organization which took over the Flanders estate of 823 acres surrounding Green Lake, has made the initial payment on the tract, and permanent organization will be perfected immediately. Included in the prominent men who compose the temporary directors are: H. M. Leland, of the Lincoln Motor Co.; C. B. Bohn, of the Bohn Foundry Co.; Colonel Sidney Waldon; C. W. Dickerson, of the Timken-Detroit Axle Co. and a number of leading figures in the automotive industry.

One of the chief features of the country club will be aviation, the grounds of the big estate furnishing an ideal flying field.

KARWISCH OPENS NEW PLANT

ATLANTA, March 26—The new plant of the J. M. Karwisch Wagon Works, manufacturers of the Karwisch lines of commercial truck bodies, has now been completed in Atlanta and manufacturing work has started in the plant. The old plant at 81 East Hunter Street has been discontinued. The present plant is twice as large as the old one, and provides more than double the capacity.

This company makes a specialty of manufacturing commercial truck bodies adapted to the particular needs of the buyer and also makes a full line of bodies

for all standard made chassis. A great deal of the machinery installed in the new plant was invented by John M. Karwisch, president of the company, to serve the particular needs of this concern. Robert C. Hackman is the vice-president of the company.

The present plant provides 33,000 sq. ft. of floor space.

Designs New Plane

LOS ANGELES, March 27—Showing something which is believed to be unique in airplane construction, D. V. Cole, for two years instructor in aeronautics at University of California, is here with a plan to establish an aerial transportation system between this city and San Francisco. Cole has designed a hydroplane using two biplanes hitched 64 feet apart on an underslung body, which serves as the pilot's pit and passenger coach. The body is 142 ft. long and 8 ft. high. The passenger capacity is 60. The wings have a spread of 126 ft. with a 14-ft. gap between. Six 400 hp. Liberty motors would be used. A speed of 100 miles an hour is claimed for the machine.

AERONAUTIC CONGRESS SET

NEW YORK, March 29—The Aero Club of America announces that the third American Aeronautic Congress will be held at Atlantic City from May 20 to 30. Before deciding on the extent of the contests the committee will wait to be assured there will be pilots and machines to compete for all the prizes which are offered.

Planes for Exploration

NEW YORK, March 27—Latin America is an open field for aircraft made in the United States, according to Francesco Yanes, assistant director general of the Pan-American Union. While this trade naturally belongs to Americans they must take advantage of their opportunities with reasonable promptness or they may expect foreign competitors to take it away from them.

Señor Yanes emphasized the need for airplanes in South America to discover unknown interior territory, rich lands hidden in inaccessible regions, and exploration generally.

GREYHOUND BUYS PROPERTY

NEWARK, N. J., March 29—The Greyhound Motor Car Co. has purchased 15 acres at East Warren, R. I., and will erect a plant for the building of automobiles. The initial unit will be of brick, 80 x 100 ft. In the meantime the company is expected to lease a factory in Warren for the making of parts.

Air Service Forms Code-of-the-Air

Lighter-Than-Air Craft Have Right of Way—Provide Passing Rules

WASHINGTON, March 26—In the absence of Federal legislation of any kind governing flying in this country, the Air Service has formulated general rules of the air as a guide to pilots. In anticipation of what will be eventually enacted, the standard regulations and rules of the air adopted by the Army Air Service are made public.

As the Automobilitist must know the rules of the road, so the aviator must know the "Rules of the Air." These, as well as the words of precaution to pilots and instructions for flying and landing after dark, conform closely to the International Air Convention, one of the products of the Peace Conference.

The General Rules of the Air provide that:

No pilot shall fly closer than 200 yds. to any dirigible, free or captive balloon.

Lighter-than-air craft will at all times have the right of way over the heavier-than-air craft.

A motor-driven aircraft must always maneuver according to these rules as soon as it is apparent that if it pursued its course it would pass at a distance of less than 200 yds. from any part of another aircraft.

When two motor-driven aircraft are meeting end on, or nearly end on, each shall alter its course to the right.

Where, by any of these rules one of the two aircraft is to keep out of the way, the other shall keep its course and speed.

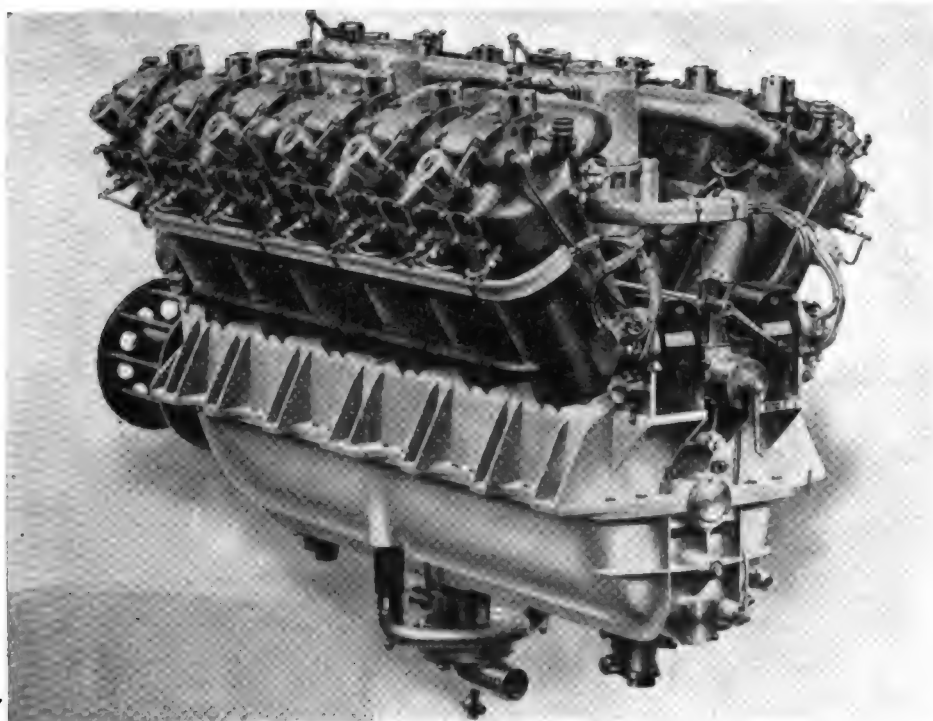
Every aircraft which is directed by these rules to keep out of the way of another aircraft shall, if the circumstances of the case admit, avoid crossing ahead of the other.

APPEAL OHIO TAX LAW

CLEVELAND, March 26—Holding that the newly-enacted Ohio graduated automobile license law is contrary to the Fourteenth Amendment to the United States constitution, the board of directors of the Ohio Automobile Association has unanimously voted to carry the case to the United States Supreme Court. An adverse decision was given in the Ohio Supreme Court recently. It is claimed that the law in question amounts to double taxation and thus is opposed to constitutional principles.

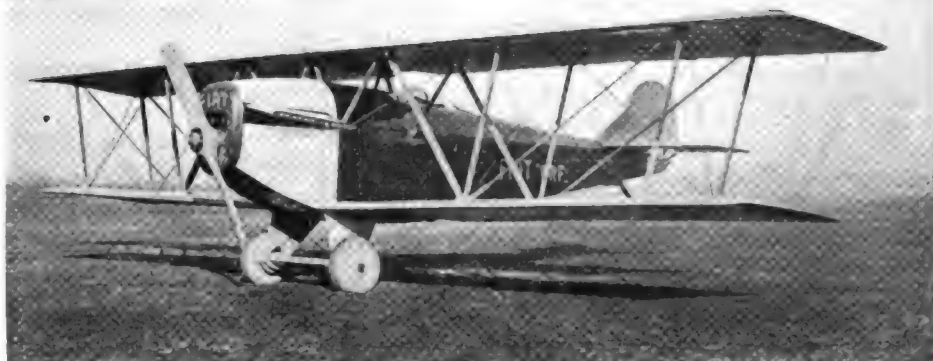
INDIA LIKES AMERICAN CARS

NEW YORK, March 26—A résumé of the foreign trade of British India for the period from 1907 to 1919, inclusive, shows that the United States held undisputed first place in the importation of motor cars. The market for automotive products in that country is steadily widening and the prospect for large sales by American manufacturers are said to be better than ever.



*This Is the Fiat Engine
and Plane Designed
for Transatlantic
Flights*

The plane, called the A. R. F., was completed February 26, at Turin. In a trial flight driven by Lieut. Francesco Brak Papa, it attained a speed of 261 kilometers an hour, with four passengers aboard. The engine is of 700 hp. Fuel sufficient for 20 hours is carried—almost enough for a round trip across the ocean



Portable Airplane Cranker Now in Use

WASHINGTON, March 29—A portable airplane engine cranker, designed by the Equipment Section of the Engineering Division, McCook Field, is now in use at this field. This starter can be accommodated to all types of engines by using suitable face plate castings. The engine cranker is driven by an automobile starting motor with storage battery, and exerts sufficient torque to spin a cold Liberty 12 engine at 40 r.p.m.

The cranker now in use at McCook Field is mounted on a 1½-ton Packard truck. The truck is driven to a position in front of the airplane, and the cranker is swivelled in the universal bowl so that its shaft approximately parallels the propeller axis. The automobile release is set at the starting position, and the engagement lever is then pushed forward until the face plate nearly touches the propeller. The necessary adjustments of the elevating and transversing mechanisms are then made and the bowl clamped in position. The engagement lever is then pushed forward so that the face plate engages the propeller hub nuts, and the starting switch is operated.

As soon as the engine starts under its

own power, the face plate automatically recedes from its engagement with the propeller hub nuts, leaving the entire starter clear of the propeller, thereby allowing the starter truck to drive away without danger of interference.

TO PROBE GASOLINE PRICES

WASHINGTON, March 29—Favorable report was ordered by the Judiciary Committee of the House of Representatives yesterday on the Dyer resolution, directing the Attorney General to make an immediate inquiry into the recent advances in the price of gasoline, kerosene and other petroleum products. The committee recommends a report to Congress by June 1.

Consideration of the sources of supply, profits of the oil business and whether any combination exists to restrain trade and regulate prices, will be undertaken.

WITHERBEE ADDS TO OUTPUT

NEW YORK, March 29—The Witherbee Storage Battery Co. has increased its production by the erection of an additional factory in New York and another at North Bergen, N. J. All the parts used in the batteries are made in the company's factories.

Grant Buys Control of Walker Engine

CLEVELAND, March 26—Announcement was made here to-day the Grant Motors Corp. has purchased a controlling interest in the H. J. Walker Mfg. Co. At the office of the Grant company it was stated that the management of the Walker company changed hands last Tuesday with the personnel of the plant practically unchanged.

The Walker Mfg. Co. has a capital of 100,000 shares, no par value, which is selling at \$25 per share. The Grant company bought the stock owned by H. J. Walker, organizer and heretofore owner of the controlling interest.

The plans of the Grant company with reference to the new plant have not been completed but for the present motors and certain auto parts will be produced. The capacity is 150 engines daily and the Grant company will take 80 of them. The remainder will be sold. In addition, the jobbing work will be continued.

Four hundred are on the payroll of the Walker company and the plant is located near that of the Grant Motors Corp. so that the finished products of the former plant can be put into Grant cars with little moving expense.

French Racing Cars Near Completion

Peugeot, Ballot, Fiat, Porporato
Soon to Test Models for
Indianapolis

PARIS, March 13 (*Special Correspondence*)—The first of the 183 cu. in. Peugeot racers built for the Indianapolis Sweepstakes was taken on the road this week by André Boillot. The tests proved satisfactory, for the car was as fast as the 300 cu. in. Peugeots built before the war. The two other Peugeot racers will be on the road next week. Drivers of the Peugeot cars will be Jules Goux, André Boillot and Wilcox.

Ballot has definitely selected his team for Indianapolis, the drivers being Ralph De Palma, Jean Chassagne and René Thomas. The Ballot cars have eight cylinders in line. They are almost completed and will be on the road next week. It is possible that Ballot will enter a fourth car, of only 122 cu. in. cylinder capacity. This machine is not expected to win, but is capable of making a fine demonstration of speed and regularity. M. Ballot, the builder of these cars, intends to come to America with his team. This will be Ballot's first visit to the United States.

The Fiat racing engines for Indianapolis are stated to be on the bench. It is not yet known whether the cars will be ready in time for the Indianapolis trials.

Jean Porporato is preparing two cars for Indianapolis. He will drive one of these himself and give the other to Jack Scales, an Englishman formerly on the Fiat racing team. Porporato has completed his bench tests and will have his cars on the road at the end of the month.

Racing cars of 183 cu. in. capacity are being built at the Mercedes factory, in Germany. Pilette has made arrangements to secure one of these and will race at Indianapolis.

PATENT SUIT SETTLED

NEW YORK, March 26—The suit which was brought by the J & B Mfg. Co. against the Gray-Heath Co. for infringement of the Jacobson patent for a timer for Ford cars by the timers made by the Cuno Engineering Company has been settled.

The Cuno company has taken a license from the J. & B. Co. and will continue to manufacture timers under this license. Further suits against other infringements will be brought.

SWEDEN WANTS TIRES

WASHINGTON, March 29—There is a great demand for automobile tires in Sweden, with American tires predominating, according to a report from Consul Sholes to the Bureau of Foreign and Domestic Commerce received recently in this city.

Extensive contracts are being let in anticipation of the opening of the new motoring season. Competition is keen, with all the leading brands represented.

Swedish motorists prefer hand-made tires as being more suitable to the road conditions. Costs play an important part in sales, but there is a considerable market for high-priced tires. In 1916 tires were imported from Great Britain to the value of \$151,500; from France, \$106,680, and from the United States, \$34,690. There is a good opportunity at present for the American tire exporter.

Owing to the increased sales of motor cars in recent months, the demand for accessories and spare parts of all kinds far exceeds the supply.

Sunbeam Engine Sets Motor-Boat Record

NEW YORK, March 29—Installed in a French motor boat, the Sunbeam Despujols engine, recently introduced in this country in the Sunbeam car, broke the world's speed record for motor boats at a private trial on the Seine, near Paris, on March 23.

The trials were carried out on a 500-meter course where the current is slight, and the official chronometers recorded that this was covered in from 14 to 16 seconds at different trials. The general speed may be set down as 120 kilometers, or 75 miles an hour.

The Sunbeam motor used in making this record is 450 hp. and weighs only 1700 kilos. Naval constructors have held that a propeller turning more than 1800 revolutions a minute would produce a vacuum about itself and in consequence fail to secure speed. The inventors of the new record-breaker, however, have disproved this theory and used a multiplier which produced 3000 revolutions a minute.

This Sunbeam motor was of the same type as those used in the British R-34, which crossed the Atlantic last summer.

TO BUILD STANDARDIZED BOATS

NEW YORK, March 29—The Burger Boat Co. of Manitowoc, Wis., will build a standardized stock motor cruiser, 30 ft. long, of the Everybody's Motor Boat type. Designs have been prepared and manufacture will be started as soon as materials can be obtained.

Three other companies already are turning out standardized boats. They are the International Shipbuilding & Marine Engineering Corp. of Nyack, N. Y., which uses Kermath engines; the Elco works of Bayonne, N. J., which uses J. V. B. engines, and the Red Bank Yacht works at Red Bank, N. J., which uses the Red Wing Thoroughbred engine.

The Huss Motor Co. of Detroit has put on the market a marine motor single cylinder engine in which it is using Ford parts.

KARDELL PRODUCTION GROWS

ST. LOUIS, March 29—The Kardell Tractor & Truck Co. announces that it is now producing at the rate of 15 machines a week and expects to increase the number to 10 a day by July 1. Felix Garnier has been appointed assistant general salesmanager, and Nelson B. Nelson of Racine, Wis., superintendent.

Reaffirm Decision on Paris 1920 Show

Junior Manufacturers Threaten
to Hold Show of Own—Plead
Lack of Production

PARIS, March 13 (*Special Correspondence*)—By twenty-two votes to fourteen the French Syndicate of automobile manufacturers, which corresponds to the Automobile Chamber of Commerce, has voted against the Show in Paris in 1920. This merely confirms the vote taken by the presidents of all the trade organizations interested in the Paris Salon a few weeks ago. The Chambre Syndicale is the most powerful of the trade organizations in France, for it controls practically all the automobile manufacturers of that country.

The minority is very dissatisfied with this decision and threatens to take such action that an automobile show will be held despite the vote. It is claimed by this minority that the 1920 show has been abandoned in order to prevent the younger firms from gaining a footing in the world's market. If the minority in favor of a show breaks away from the majority, it will be practically impossible for them to secure the Grand Palais in the Champs Elysées. This, however, will not prevent them from holding a show in some other central hall in Paris if they so decide.

The main argument of the majority is that they have not yet got into production on the models exhibited in 1919, and will only have begun production on an important scale by the end of the summer of 1920.

They claim, therefore, that they will have nothing new to exhibit and that there is no necessity for a show which would be nothing more than a repetition of last year's exhibition. There is a strong hope among the anti-show section that England and Belgium will follow their decision. It is practically certain that neither London nor Brussels will consent to abandon their shows. A keen fight is expected on the Paris show question.

DECREASE IN FRENCH CARS

PARIS March 13 (*Special Correspondence*)—There are 94,884 passenger-carrying automobiles in France, according to official figures just issued. In 1914 the number was 107,535. These figures must not be accepted as an indication of the total number of automobiles in France. The official returns only cover privately-owned passenger cars which have paid taxes, no account being taken of trucks, taxicabs, motorcycles, motor omnibuses or cars engaged in private hiring business. It is certain that there has been an enormous increase in the number of trucks in service since the war, but no official figures are available regarding these.

The district of France which has the greatest number of cars is Paris, with 16,089; the Rhone district, including Lyons, has 30,27 cars.

Elmer Apperson Dies Suddenly

Head of Apperson Company Is
Stricken While Watching
Los Angeles Races

LOS ANGELES, CAL., March 28—Elmer Apperson, senior member of the firm of Apperson Brothers' Automobile Co. and one of the country's pioneer automobile manufacturers, was stricken with heart disease while attending the automobile races at the speedway here today and died within a few minutes. Mr. Apperson was 58 years old and is survived by his widow and two brothers, Edgar and Oscar.

Mr. Apperson, his wife and a party of friends were occupying a box at the speedway when the stroke came. He had been here two months combining a visit for his health with the opening of the new building occupied by his factory branch. He suffered a stroke of paralysis about three years ago and his health had been impaired ever since.

About two years ago he withdrew from the active direction of his company, placing the management in the hands of his brother, Edgar, but retaining his position as president of the company. The body will be removed to Kokomo, Ind., the family home and location of the Apperson factory.

The Apperson brothers, who supplied the factory facilities for the building of Elwood Haynes' early cars, were associated with him for many years in commercial production. Elmer Apperson and his brothers invested time, money and reputation in the development of Haynes' ideas at a time when such investments were generally held to be legitimate reasons for cancelling bank credit.

Although differences subsequently arose between the partners it does not becloud the fact that the Appersons had a very definite hand in developing the first real automobile. It also is an unquestioned fact that the product of the Apperson company has played an important part in popularizing the automobile from pioneer days to the present.

OVERLAND PRICES GO UP

DETROIT, March 29—Increases on Overland and Willys-Knight open models have been announced. Overland Four, both touring and roadster have been advanced \$40. Willys-Knight touring and roadster have been advanced \$275. Overland prices now are \$985 f.o.b. factory, and Willys-Knight, \$2,250. No increases were announced on closed models.

WOULD CLEAR STATE ROADS

ALBANY, N. Y., March 30—The Senate Internal Affairs Committee is expected to make a favorable report soon on the bill of Senator Yelverton of Schenectady providing for the removal of snow from State roads in winter to permit uninterrupted motor traffic. No op-

position developed at the recent hearing on the bill, which was favored by automobile associations throughout the State. The bill authorizes boards of supervisors to designate roads from which the snow is to be removed and to make appropriations from county funds for removing it. The estimated cost of removal in normal winters is \$10 a mile, but the cost of removing accumulated snow the past winter on the road between Albany and Schenectady has been more than \$50 a mile, which was paid for by the two cities.

Racing Driver Wants Berth

NEW YORK, March 30—Who's in the market for a racing car driver?

A. Guyot, one of the famous French drivers, is looking for a job, according to his friends in this city. He was in the big Indianapolis race last year and wants to get in again. He is still in France but is eager to come to the United States if he can get an opportunity to show his skill as a racer.

Five Sessions Chosen for S. A. E. Summer Meet

NEW YORK, March 29—The program for the summer meeting of the Society of Automotive Engineers, which will be held at Ottawa Beach June 21-25, inclusive, was announced to-day. It follows:

Monday, June 21—Standards and Business Session.

Tuesday, June 22—Fuel Session.

Wednesday, June 23—Transportation Session.

Thursday, June 24—Farm Power Session.

Friday, June 25—Production Session.

One professional session will be held each day. A list of sports and recreations which "will eclipse last year" is promised, with lectures and dancing each evening.

TO BUILD IN SINGAPORE

AKRON, March 29—The Keystone Tire & Rubber Co. announces that it has made plans for the construction of a \$1,000,000 plant in Singapore by a subsidiary company. The plant will condition the rubber direct from the Straits Settlements plantations and will compress it to make transportation easier and less costly.

GOODYEAR LEASES COAL LAND

AKRON, March 29—A lease on 5200 acres of coal land in Ohio, owned by J. H. Somers Coal Co., Harrison City, Ohio, has been taken by the Goodyear Tire & Rubber Co. The company has the option of purchasing at the expiration of the lease. Mining operations will be conducted under the name of the Wheeling Township Coal Mining Co.

Form Committee to Aid Transportation

Automotive Makers to Serve in
Promotion of Highway De-
velopment Projects

WASHINGTON, March 29—A Committee on Transportation will be organized by the Federal Highway Council, this city, on April 5, when approximately forty representatives of the motor car industry, automotive publications, chamber of commerce, fleet operators, tire companies and various organizations and associations related to the highways, will meet at the office of the council.

The purpose of the committee will be to co-ordinate the various highway interests with general transportation interests. Representatives will be present from the public, from the motor truck industry, from farm interests, and to represent general business. It is expected that the meetings which will take one day, will result in the appointment of various subcommittees handling different problems related to highway transport, which will take up these problems at later times in their various localities of the country.

Further, the committee, which it is expected will work with the Transportation Bureau of the Federal Highway Council, will attempt to realize the needs of road users, visualize future highway transportation requirements, co-operate with railroads and waterways, and study all of the many problems attending the entrance of the motor truck into commercial life, encouraging establishment of motor express lines and generally stimulate the use of highways.

A curious fact in connection with construction problems at the present moment, is that the building of roads is seriously hindered by the same evil which they are designed to remove—lack of transportation. According to authoritative information, production is halted to a greater degree by inadequate transportation facilities than by labor shortage. At least this is true, it is claimed, in the production of materials for road building.

PATRIOT TO MAKE CARS

LINCOLN, NEB., March 29—The Patriot Motors Co., a reorganization of the old Hebb Motors Co., has been incorporated with a capital of \$10,000,000. It is proposed to erect three or more new buildings on the company's tract at Havelock and eventually employment will be given to more than 2000 persons. The company proposes to branch out into the production of passenger cars.

The incorporators are A. G. Hebb, E. C. Hammond, L. A. Winship, K. W. Gillispie and A. H. Armstrong. The company now has representatives in Canada, Mexico and almost every country in South America and contemplates the development of foreign markets for its trucks.

Association to Aid Farm Motorization

Truck Makers to Be Called in Convention to Discuss Plans

NEW YORK, March 30—Motorization of the farms in the metropolitan district, virtually a virgin field, has been undertaken by the Motor Truck Association of America. A convention of manufacturers, dealers, bankers and farmers will be called at the Waldorf-Astoria soon to develop interest in the project and outline the possibilities of the truck and tractor in the great garden areas which supply Greater New York and New Jersey cities with fresh vegetables and dairy products.

The first step will be an intensive educational campaign. When farmers and dealers are alive to the advantages of motorization an actual outdoor demonstration will be given on a large farm in the borough of Queens, actually within the city limits. Not only will trucks and tractors show what they can do under expert direction but all kinds of modern agricultural machinery will be put through their paces.

Dealers in the metropolitan area have paid practically no attention to the development of trade in the agricultural communities which lie almost in front of their doors. Some trucks are in use on the nearer end of Long Island but in the more remote sections they are seldom seen hauling produce to market. Farmers and market gardeners have not been sold on the possibilities of economies and increased profits which would result from their use. The same is true of tractors to an even greater extent. Similar conditions prevail in Westchester county and in New Jersey.

COMPLETE PARTS FACTORY

CHICAGO, March 27—In spite of severe winter weather, the Chicago factory of E. Edelmann & Co., manufacturers of automobile parts, will be completed April 15. The building, which is considered the first unit, is 217 x 725 ft., with the main line of the Chicago, Milwaukee & St. Paul Railroad at the rear. The factory will have all provisions for the welfare and comfort of employees. No artificial lights will be used.

A branch factory will be opened at Walkerville, Ontario, May 1.

MERGER TO BE RATIFIED

NEW YORK, March 27—Special meetings of the stockholders of J. H. Williams & Co., at Brooklyn, N. Y., and of the Whitman & Barnes Manufacturing Co., at Akron, Ohio, have been called for April 2, to ratify an agreement entered into by their presidents for the merging of the Chicago and St. Catharines, Ontario, plants of the Whitman & Barnes Manufacturing Company with J. H. Williams & Co.

When ratified this plan will contemplate the operation by J. H. Williams

& Co. of drop forging and drop forged tool plants at Brooklyn, Buffalo, N. Y., and West Pullman, Chicago, and at St. Catharines. The business will be operated by the individuals now connected with these plants.

The Whitman & Barnes Company's Chicago plant includes the new forge shop, 100 x 500 ft., and a large power house which has just been built. Whitman & Barnes will continue its business of making twist drills, reamers and collateral lines on an extended scale at Akron.

Prizes for Coal Gas Fuels Are Withdrawn

LONDON, March 11 (*Special Correspondence*)—The Automobile Association in 1918 offered a prize of \$5,000 for the best system of enabling coal-gas to be used as a vehicle fuel. At that period it seemed likely that coal-gas would "take on," as, apart from the shortage of gasoline and other liquid fuels. Inventors had brought out plants for compressing and storing the gas in bottles, and it was thought that a system of interchangeable gas-containers would be set up in connection with garages, after the model of the dissolved acetylene system.

A wide publicity at home and abroad was given to the scheme, and a number of competitors were attracted, of which eleven were found to conform with the conditions as laid down. They were notified to forward their plants, etc., for testing, but none arrived. The competition was then extended to last autumn, but again without success, and now the offer has been withdrawn.

ENGLISHMAN.

CANADA ORDERS TRACTORS

PORT WASHINGTON, WIS., March 29—The Turner Mfg. Co., manufacturer of Simplicity gas engines and tractors at Port Washington, Wis., has received orders from its Canadian distributors for more than \$60,000 worth of tractors for immediate shipment. The removal of the import duty on tractors by the Canadian Government has stimulated business to an unusual extent.

MARVIN TRUCK TO BUILD

KENOSHA, WIS., March 29—The Marvin Truck Co., Kenosha, Wis., will add 45,000 sq. ft. to its works, which will enable it to double its output. In 1919 the production numbered 381 trucks, while the 1920 schedule calls for a minimum of 750. The new shop will be used for assembling, inspection, testing and shipping, releasing a large amount of space in the present plant for machine shop use.

MOLINE UNIT UNDER WAY

MOLINE, ILL., March 29—Plant No. 3 of the Moline Iron Works, erected on the old Moline Three-I league ball grounds, has started production. Employment will be given to from 200 to 250 men.

Will Investigate Farm Equipment

Economic Factors of Farm Power to Be Studied by Government

WASHINGTON, March 29—Investigation of farm tractors to determine testing and rating, of horses to secure working rating, of farm machines and implements to measure the power requirements, and of farm operations generally to secure accurate data relative to farm power, will be undertaken by the United States Department of Agriculture jointly with state colleges, agricultural and trade organizations in the near future.

Congress has been asked for funds to carry on the investigations, and as soon as they are made available work will be begun. This work is the result of suggestions made at a general conference on farm power problems participated in last fall at Chicago by representatives of the United States Department of Agriculture, state colleges and other associations.

The economic factors of farm power problems have been divided into farm power requirements to include field operations and hauling, animal power, mechanical power, relation of forms of farm power to man labor and influence on the farm organization and operation. Field operations include plowing, disking, seeding and harvesting.

Belt, drawbar and fuel economy tests of farm tractors, education in the care and use of farm equipment, service to owners of machines, causes of successes and failures in farm machines, adaptability and the power requirements of all types of farm machines and implements will be studied.

Will Apply All Tests

The testing and rating of farm tractors will include field and laboratory tests to determine belt brake horsepower and drawbar horsepower, as well as the fuel consumption of the tractor. These tests will be made under varied load conditions, probably at half and full load as rated by the manufacturer and also at maximum load that can be developed. The tractors will be operated at the speeds recommended by the manufacturers. There will be an endurance test for the purpose of showing any defects that may exist and to determine whether the rated load can be secured under conditions of continuous operation. It is proposed to issue a card showing the ratings of tractors. The committee decided that each of the forms of farm power now found on the modern farm in this country has its place, and that the central problem is to ascertain the respective fields in which each form of power can be used and the relative profit of the different forms in the fields in which they compete. It also declared that it is necessary to provide official ratings for tractors and that these should be Federal rather than State ratings.

Government Tests New Heating Furnace

Will Determine Feasibility of
Producing Heat-Treated Steel
Seamless Tubing

WASHINGTON, March 26—The Material Section, Engineering Division, is supervising a test of the Government furnace at Shelby, Ohio. This furnace was installed during the war for the purpose of heat-treating steel tubing in quantities for airplane construction, but was not completed until very recently. It is now undergoing a series of tests to determine the feasibility of producing heat-treated steel seamless tubing of very high tensile strength and elastic limit, to particularly meet Air Service Specification No. 10,229, for axle tubing.

The furnace, located at the plant of the Ohio Seamless Tube Co., is 7 ft. in diameter and 22 ft. deep, electrically heated and automatically controlled so as to give constant temperature within very narrow limits. The tubing is lowered into the furnace, which is sunken so that the top of the furnace is level with the floor, in a steel container (capacity 1152 ft. of 2 in. tubing) by means of a crane. On reaching the required heat the container with its cargo is hoisted out of the furnace, transported over the quenching tank where the bottom of the container is opened and the steel tubing, at the quenching temperature, is allowed to drop into the oil quenching bath.

The tempering operation is conducted in a similar manner, except that the maximum temperature of the tubing in the furnace is, of course, lower than it was for the quenching operation. These temperatures run approximately 1400 to 1600 deg. Fahr., for the quenching operation, and 400 deg. to 1000 deg. for the tempering operation, depending on the quality of steel used and the physical characteristics desired.

The furnace will be used principally for the heat-treating of alloy steel tubing with special reference to the tubing used in axles. Up to the present time no axle tubing has been produced in quantities which will meet the requirements of Specification No. 10,229, calling for 200,000 lb. tensile strength with five per cent elongation in 2 in.

NASH PLANTS NEAR READY

KENOSHA, WIS., March 29 — The Nash Motors Co. is completing a series of important factory extensions at its main works in Kenosha, Wis., where the Nash six and the Quad and other motor trucks are manufactured. Work on the new four-cylinder car division at Milwaukee also is nearing completion. At Kenosha there has been erected a foundry addition, 120 x 120 ft.; pattern storage and auxiliary, 80 x 100 ft.; roller bearing tool room and pattern shop, 100 x 600; addition to the sheet metal shop, 32 x 236 ft., and the courts between various shops have been roofed to form

bays, measuring 42 x 236 ft., 60 x 257 ft., 90 x 257 ft. and 16 x 180 ft. A new boiler room, 50 x 50 ft., and an addition to the heat-treating building, 40 x 140 ft., are nearing completion. Work has been started on a brick and steel body shop, 40 x 1450 ft., three to five stories high. The aggregate floor space of the plant at Kenosha is now nearly 1,275,000 sq. ft. The payroll numbers in excess of 5,000 operatives, with more than 1,500 productive machines and 300 factory maintenance tools.

Milwaukee Wants Automobile Makers

MILWAUKEE, March 29—To sustain and accentuate in every way possible a big industrial development campaign directed largely at the automotive parts and general metalworking industries, the Milwaukee Association of Commerce has made important changes following the election of a new administration composed of the younger business men of the city.

One of the first steps of moment is the acquisition of Phil A. Grau of Chicago at a salary of \$15,000 a year as business manager, a position formerly known as general secretary and paying \$6,000 a year. The new census of 1920 shows the population of the city of Milwaukee to be 457,147 and that of the metropolitan district as 541,000, a gain of 22.3 and 36 per cent respectively.

TIRE PRODUCTION IN MAY

CLEVELAND, March 29—The Denman-Myers Cord Tire Co., a new \$2,500,000 corporation, announces that it expects to be in production soon, possibly as early as May 1. Its plant is located at Warren, Ohio, while the general offices are in this city.

M. A. M. A. Works Out Advertising Plans

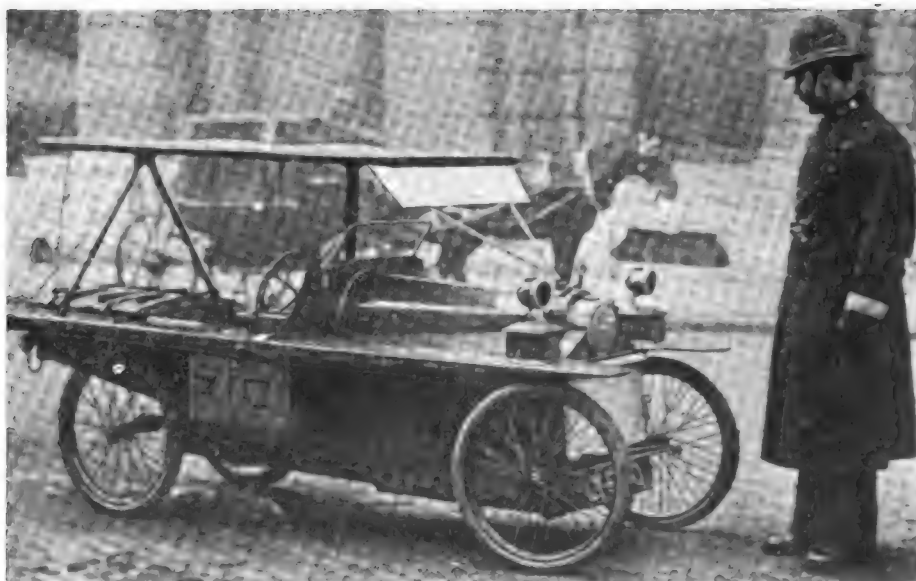
Committee of New Division
Named to Plan Activities
of Counsel

NEW YORK, March 29—Advertising problems of the automotive industry exclusively will be considered by an organization of advertising managers which will work within the Motor and Accessory Manufacturers' Association. Sixty advertising managers, representing some of the largest companies in the industry, attended a meeting at which a committee was appointed to work out the details and scope of the new association. All of them pledged their hearty support.

The committee is headed by E. C. Tibbitts of the B. F. Goodrich company, who will be assisted by J. J. Buzzell of the motor bearing division of the Hyatt Roller Bearing Co. of Detroit, and M. L. Hemingway, general manager of the M.A.M.A. These three were authorized to add new members to the executive committee as the need arises.

The main purpose of the organization will be to discuss strictly advertising problems as they relate to the automotive industry. It was explained that the national associations cover such a diversity of subjects that those of the automotive field are not covered sufficiently. J. C. McQuiston, president of the National Advertisers' Association, cordially endorsed the idea of having advertising managers specialize in their fields. Another speaker at the preliminary meeting was Richard H. Lee, special counsel of the vigilance committee of the Associated Advertising Clubs of the World.

A British Fly-Weight Motor Car



A London bobby giving the "once over" to a novel cycle car parked at the curb in Piccadilly. The machine is fitted with a hood and there is a place to carry luggage at the back. These cars would be useful to business men in event of future strikes

Australian Firm Opens Office Here

May Brothers, Largest in the
Antipodes, Locate Buying
Office in Detroit

DETROIT, March 29—Convinced that the American automobile not only will retain its hold but will increase its prestige in his country, H. May, of the firm of May Brothers, Proprietary Co., Ltd., of Sidney, Australia, has arrived in Detroit to open an office for the purchase of equipment for distribution in that territory. In addition to handling automobiles, May Brothers are the largest distributors of automobile, motor boat and marine accessories in West Australia, New South Wales and Queensland.

May Brothers have just completed a new factory, where they are building forty bodies each week to be used on American chassis. Under Australian laws one body is allowed to enter the country for every three chassis. This is due to labor in legislation in protection of Australian industry and necessitates the building of a majority of the bodies in that country.

"The American car has secured a firm hold in Australia," said May "there is no chance for British or any other product to overcome the lead secured by the American manufacturers. In fact, in Australia we like the 'pep' and enthusiasm of the Americans. An illustration of this is furnished by my recent visit to London. I visited a factory to secure equipment, and after stating my business, what I wanted, and going over in detail with the manufacturer as to what our requirements would be annually, he told me to incorporate that in a letter and post it to his firm, when the order would be taken care of.

"Hours mean dollars to us, and I promptly told him that if those were the methods to be pursued by British industries there was little chance of their making much headway in our country. I told him that in the time being consumed while the letter was being sent to him and deliberated upon in his office, an American manufacturer would have the shipment half way to Australia. That ended my efforts in England.

American Cars Sold Ahead

"All the American cars for which we secure shipping space are being sold rapidly, and every dealer in Australia has hundreds of orders booked ahead. Not only are we building bodies for distributors in our own territory, but also for New Zealand. It might be interesting for you to know that we built the body for the Dodge car, which created so much favorable comment at the New York show.

"May Brothers' representatives cover all of Australia visiting every garage of any consequence, and furnish the majority of the equipment used there."

May expects to be in Detroit for the next eighteen months arranging connections for future distribution of equip-

ment. The firm expects to spend between a fourth and a half million dollars annually with American manufacturers for equipment alone. Meanwhile, body building efforts will be extended in the endeavor to keep up with the importation of American chassis. May said there is plenty of money in Australia, and despite the 50 per cent duty, the highest in the world, buyers are eager for American cars, and never haggle over the price.

The vast farming districts of Australia, May says, furnish a vantage ground for tractor manufacturers, and he predicts the business in tractors will be even greater than in passenger and commercial cars within a short time. A committee now is in this country investigating the work of tractors and their adaptability to Australia, and reports thus far, according to May, are to the effect that the tractors in use in American agriculture are highly adaptable to Australia.

Brooklyn Parts Men to Exhibit Products

NEW YORK, March 27—Brooklyn is to have a home town Industrial Exhibition in the Twenty-third Regiment Armory, April 10 to 17, inclusive. While the list of exhibitors shows no factory that turns out a complete automotive vehicle, there will be thirty exhibitors whose plants are well known to the industry.

H. H. Doehler, of the Doehler Die Casting Co., has been selected to open the exhibition, and his two associates in that ceremony are Frank H. Moses, of the Adriance Machine Works, and J. O. Skinner, of the E. W. Bliss Co.

Other exhibitors of interest to the automotive industry are: T. R. Brawley, Duplex Engine Governor Co., Eastern Tube & Tool Co., Eisemann Magneto Co., Estey Brothers, Fairbanks, Morse Co., Fulton Foundry & Machine Co., Generator Valve Co., Greenpoint Belting Co., Hay-Hudden Mfg. Co., Hilo Varnish Corp., Irving Iron Works, Laurence Belting Co., Murcott & Campbell, New York Leather Belting Co., Thomas Paulson & Son, Inc., the Peelle Co., Penn Brass & Bronze Works, John Polachek Bronze & Iron Co., Reliance Metal Spinning Stampings Co., Inc., J. W. Richardson Foundry & Metal Corp., The V. & O. Press Co., Valentine & Co., William Vogel & Bros., Inc., Wahlstrom Tool Co., J. H. Williams & Co.

JOIN ILLINOIS ASSOCIATION

SPRINGFIELD, ILL., March 27—Every branch of the automotive and allied industries is represented in the Illinois Automotive Dealers' Association which was organized here this week. Several car manufacturers are included in the membership which embraces dealers in passenger cars, trucks, tractors, tires and all kinds of equipment. The manufacturers said they believed they could get valuable ideas for their production and service departments by a close affiliation with the men who sell the goods they make.

Highway Motors Co. Absorbs Two Plants

New Ohio Corporation to Make
Engines—Takes Over Detroit
Concerns

DETROIT, March 30—Highway Motors Corp. of Defiance, Ohio, capitalized at \$1,500,000, has taken over Golden, Belknap & Swartz, manufacturers of engines, and the Fruchey Machine Co., makers of automobile parts. The new corporation has divided its stock equally between common and preferred, all the common having been paid in.

Highway Motors has taken over a factory at Defiance, to which additions will be built. The plant will be equipped for the manufacture of high grade engines for passenger cars and trucks. Special machines for making a new model G. B. & S. will be installed at a cost of \$250,000. The Ohio factory will be ready for operation Oct. 1. The Detroit plants will remain at work in the meantime.

A daily production of 150 of the new model engines is proposed. A testing department will be built apart from the new factory.

Golden, Belknap & Swartz, with a capacity of 60 engines a day, have been supplying Bell Motor Car Co., York, Pa.; Pioneer Truck Co., Chicago; Laverne Automobile Co., Chicago; Laverne, Minn., and Defiance Truck Co. The Fruchey Co. manufactures crank cases for King Motor Car Co. and has contracts for parts with many of the larger automobile manufacturers.

The new company is headed by C. H. Kettenring of Kettenring Machine Co., Defiance. R. P. Kettenring is first vice-president; E. H. Belknap, Detroit, second vice-president and chief engineer; J. W. Swartz, third vice-president and purchasing agent; A. M. Pierson, Detroit, fourth vice-president, and J. W. Wright, secretary and treasurer.

TO STUDY LABOR SITUATION

WASHINGTON, March 29—Because of the scarcity of rough labor in the United States, the House Immigration Committee will investigate general conditions throughout the country with a view to recommending necessary legislation.

ENGLISH WALLIS UNDER WAY

RACINE, WIS., March 27—The Wallis tractor is being manufactured in England for the British Wallis Tractors, Ltd., and the first run of production will be made by Rushton-Hornsby, Ltd., Lincoln, England.

SHOTWELL-JOHNSON BUYS SITE

MINNEAPOLIS, March 27—A ten-acre tract upon which to build a larger plant for the manufacture of sheet metal parts and radiators has been purchased by Shotwell-Johnson Co. It will be located in northeast Minneapolis.

British Engineers Elect New Council

Only 38 Per Cent of Membership
Votes at Elections—Gains
47 Members

LONDON, March 12 (*Special Correspondence*)—The new council of the Institution of Automobile Engineers consists of Sir Herbert Austin, Captain J. S. Critchley, W. J. Iden, F. W. Lancaster, Lt. Col. M. O'Gorman, Major B. W. Shilson, F. G. Wollard, Lt. Col. T. B. Browne, Sir Robert Hadfield and Douglas Leechman, F. L. Martineau, H. R. Ricardo, and E. B. Wood. The ballot for these elections attracted only 38 per cent of the membership, leaving it to be inferred that 62 per cent were not interested in this usually accounted important proceeding.

The annual report shows that the membership of all grades numbered 1200 at the end of 1918, and 1247 at the like period of 1919. Fourteen members in all grades died, six resigned, 39 were transferred to higher grades, and 117 names were removed. The net gain in membership, therefore, was 47, made up of one honorary member, 14 members, 56 associate members and 10 associates.

There has been a decrease of 34 in the graduates section, which numbered 238 at the end of 1918, and had fallen to 204 at the end of 1919. This shrinkage is not an encouraging sign, having regard to the lessons of the war, and in view of the new British Education Act which imposes continued attendance up to 18 years of age at technical and other schools after the normal leaving age for scholars for elementary schools.

The Institution, it has been felt for some time, has needed "bucking up"; the monthly papers being until recently more academic than practical; in fact, blame on this score might be leveled against some other British scientific and technical bodies.

ENGLISHMAN

KILL BUS TAX ORDINANCE

ST. LOUIS, March 27—The Board of Aldermen has killed a city ordinance, providing for the regulation of motor-bus traffic and levying an annual license fee of \$25 for each bus in addition to an operating tax of 3 per cent of the gross revenue. The chairman of the legislative committee stated that the Missouri Motor Bus Co., now operating a line, had consented to paying the tax. The ordinance was defeated on the ground that it would be unfair to the companies to pay a tax until the business is firmly established.

DRAKE PLANS FOREIGN TRADE

SAN FRANCISCO, March 29—Demand for their product from foreign countries is reported by the Drake Lock-Nut Co. By investigating ocean freight rates and getting an average, it was learned by George F. Drake, general manager, an average slightly lower discount from the list price of Drake lock

nuts would pay the ocean freight rates to any usual seaport in the world, and in a few cases a combination of rail to Galveston, New Orleans, New York or other seaport.

In some cases the freight rate will amount to slightly more than the amount gained by the lower discount from the list price and in others it will be slightly less, so that an average is obtained thus enabling the Drake Lock-Nut Co. to quote their product c.i.f. to any seaport in the world.

American Develops New Farm Light Unit

CHARLES CITY, IOWA, March 29—The farm lighting outfit of the American Tractor & Foundry Co., Charles City, which will be sold under the trade name Americo, if the same can be copyrighted, is of 1500 watt capacity and comprises a single cylinder $3\frac{1}{2} \times 3\frac{3}{4}$ in. engine operating at 1200 r.p.m., which is connected by means of a flexible coupling to the electric generator. Deliveries are to begin in April and it is planned to turn out 5000 of these plants the first year.

The crankshaft is carried on ball and roller bearings. A spiral gear drive is used for the camshaft, which carries the timer at one end and is arranged to take a governor at the other, if desired. A Westinghouse generator is used. It has a normal capacity of 50 amperes at 36 volts. The switchboard is mounted directly on the generator frame, and this equipment is assembled as one unit, with short connections between the generator and the switchboard. The governor, which is furnished only as an extra, acts on the throttle valve and is claimed to control the speed within a limit of $2\frac{1}{2}$ per cent.

The engine is designed with the idea of having enough power to operate washing machines, etc., while running the generator at its full capacity, and to this end is provided with a $2\frac{1}{2} \times 4$ in. pulley, which is secured directly to the flywheel.

The switchboard is mounted on the generator by brackets, which support the switchboard and fuel tank. It is 8 in. wide by 12 in. high. On it are mounted a voltmeter, an ammeter, a service switch, service fuses, a starting switch and an automatic cut-out.

TO ORGANIZE CHAMBER

WASHINGTON, March 27—The new International Chamber of Commerce, projected at the International Trade Conference at Atlantic City last October, will be formally organized, it is announced by the Chamber of Commerce of the United States, at Paris, during the week of June 21, 1920. Invitations have been sent out by the American group of the International Organization Committee to business and industrial associations, asking them to name delegates to participate in the organization meeting. About 100 American delegates are expected to attend.

Corner in Stutz; Trading Suspended

Stock Exchange Governors Take
Drastic Action After Sen-
sational Rise

NEW YORK, April 1—Trading in the stock of the Stutz Motor Car Co. on the New York Stock Exchange was suspended indefinitely by the Board of Governors at the close of business Wednesday. The action was taken after it had been determined the recent amazing advances in Stutz stock were the result of a corner. The shares sold yesterday at 391.

No intimation has been given as to what plans are under consideration for fulfilling contracts entered into between buyers and sellers. Allan A. Ryan & Co. control, in certified form, about 80 per cent of the Stutz shares and have contracts for the delivery of Stutz stock making up more than the remaining 20 per cent of the 100,000 shares. Ryan & Co. printed an advertisement this morning announcing they would buy Stutz stock.

Although Stutz has not actually been banished from the exchange, it is believed it will be forced onto the outside market.

There had been reports that the Business Conduct Committee of the New York Stock Exchange was not overlooking the possibility of a corner in Stutz. The policy of the exchange has been not to permit corners, and an incipient one in General Motors was broken recently.

Stockholders of Stutz Motors at a meeting Friday authorized an increase in capital stock from 100,000 shares of no par value to 120,000 shares of no par value. The additional 20,000 shares will be used to pay a stock dividend of one-fifth of a share, recently declared payable April 15. Shorts in Stutz will have to pay this dividend, which, based upon the present value of shares, will amount to approximately \$60 a share. There are unconfirmed reports that the company intends to pay 100 per cent in stock dividends during the year.

The General Motors Co. started the dividends of the present year on a 20 per cent per annum basis, divided equally between cash and stock, so that the value of the whole is about \$50 per share, or more than 25 per cent larger than the past year's earnings. General Motors is expanding very rapidly. Production is now about 1800 motors a day, and it is predicted that before the end of the year the company will be doing a business exceeding \$1,000,000,000 per annum. The earnings are relatively small, however, compared with the magnitude of the business.

Reports that General Motors contemplated absorption of Pierce-Arrow and Stutz are emphatically denied and apparently are without foundation. Pierce-Arrow stock has been very active on the stock exchange recently, as has that of White and Maxwell. All three have made substantial gains of late.

Scotch Want Cars, Turn to America

British Unable to Meet Demands
and Tariffs Hurt Other
Countries

WASHINGTON, March 26—A probable market for automobiles exists in Edinburgh and throughout Scotland as a result of the lessons brought home to the Scotch people during the war, when horses had to be turned over to the military forces and mechanical traction methods were introduced, according to a report received from Consul R. Fleming by the Bureau of Foreign and Domestic Commerce. The result is an enormous demand for motor vehicles, greater than the supply.

Prior to the war Germany shipped many cars into this market, but although, states Consul Fleming, the bitterness against Germany has abated somewhat, there is no desire to handle German goods. Belgian cars have a fair reputation but are not being produced in sufficient quantities. Italy and France are prohibited from engaging in business in Scotland by a tariff of 33½ per cent.

British manufacturers can not cope with the demand, and consequently it is to the American manufacturer that the dealers are looking. At this time purchasers are clamoring for cars and paying exorbitant prices for those delivered promptly. Five-year old motor cars have sold for 50 per cent in excess of their original cost.

One important dealer reports a steady and urgent call for passenger cars ranging from \$3,406 to \$4,866, and for business vehicles ranging from \$2,920 to \$5,840. He has had brisk inquiries for motor omnibuses and touring cars. The Corporation of Edinburgh has experimented with a type of 4-ton touring car carrying thirty-two passengers and costing \$7,780.

Bus Lines Prove Popular

These have been used for opening up to sightseers parts of the city and its environments imperfectly served by the corporation tramways. They proved successful beyond expectation and a dozen additional cars were ordered. It is a common belief that next summer there will be a great demand for such conveyances all over the country. Vehicles of 3-ton or 4-ton capacity, to seat thirty persons and to cost \$7,300 to \$7,786, are wanted to link up small outlying villages with neighboring cities or towns.

The one company which produces heavy motor vehicles in Edinburgh for its own use has a fleet of fifty motor buses running daily between Edinburgh and surrounding country towns and villages. On certain routes the company's operations have seriously affected the railways. The omnibus traffic was remarkably profitable during the summer of 1919.

Edinburgh is a particularly good place for motor car distribution, owing to its position relative to such large and im-

portant towns as Dundee and Aberdeen, and to the English border sections.

While anxious enough, naturally, that British manufacturers and workmen should benefit by the demand for motor vehicles, dealers are not disposed to argue the point; they are not particular where the cars come from if the right goods come to the market promptly. One large firm freely says that the public are recognizing that American-made cars are more fully equipped than British cars, and contain many little luxurious touches which British makers have apparently not yet thought of.

Inferiority Notions Dissipated

The old notion that the American car is less solidly built than the British has been dissipated. Quality for quality, American cars can be marketed in Scotland for lower prices than those obtaining for British makes. Spare parts of American makes can also be obtained with ease and at prices more consistent with the manufacturing costs.

On October 1, 1919, there were in the Edinburgh consular district 5556 private automobiles, 2864 cars used for trade purposes, 1219 taxis and private cars used for hire, 1132 heavy motor cars (of more than 2-ton weight), and 8145 motorcycles.

St. Louis Association to Lease Warehouse

ST. LOUIS, March 26—A separate corporation is being organized by members of the St. Louis Automobile Manufacturers' and Dealers' Association to lease a large warehouse in East St. Louis for the storing of cars. The purpose is to combat what they term the high cost of storage in St. Louis, the charges being from \$7 to \$9 per month per car. No suitable building on this side of the Mississippi is available. The East St. Louis warehouse is available to the railroad tracks, and most of the cars shipped to St. Louis are from the East. The plan is to base the storage charges on the actual cost of rent and operation.

The matter was discussed at last Thursday evening's meeting of the association. Here also it was decided to take a poll of the members to ascertain the number of used cars, and their makes, in the hands of dealers. The object of the census was to learn whether the number of used cars on hand was normal.

Resolutions were adopted urging railroads to have wide-door cars adapted to carrying motor cars built in their new equipment.

MAINE PLANS HIGHWAYS

AUGUSTA, ME., March 26—The State Treasurer has sold to a New York syndicate \$2,500,000 of highway and \$500,000 of bridge bonds.

CAPITAL STOCK INCREASED

MILWAUKEE, March 26—The Economy Carburetor Co., Milwaukee, has increased its capital stock from \$50,000 to \$75,000 and will increase its output.

Says Workers Will Control Industry

British Motor Trade to Pass from
Capitalists, Says Union
Secretary

LONDON, March 11 (*Special Correspondence*)—Tom Mann, a well known and respected labor leader and recently appointed secretary of the Amalgamated Society of Engineers, told a big meeting in London that capitalistic control of industry is doomed, and urged the workers to adopt a practical rather than a speculative policy.

He enunciated as a principle that an industry must be responsible for maintaining all connected with it, and subsequently the meeting interpreted this ideal in the terms of a resolution affirming "the advisability of establishing machinery which would be instrumental in facilitating the creation of a national movement with the object of taking over and controlling the whole of the engineering industry by the co-operative engineers themselves."

After a discussion on the wages and the 1917 agreement, a resolution was carried "refusing to recognize the 1917 agreement because it was signed without the consent of the members and, in any case, that it was a war-time measure and was therefore not now operative, and instructing the London district to press for a basic rate of 72 cents (pre-war rate) per hour, and to take such steps as may be necessary to bring this about."

It is noteworthy that this rate per hour is a trifle less than the Ford company is paying without reference to whether the worker is skilled or unskilled, or a member of a trade union. It should be noted also that the A. S. E., the trade union concerned, is the largest and wealthiest of British trade bodies, and has adopted a working agreement with other bodies which is likely to weld the whole of the mechanical trade unions into a solid federation for co-operative effort. It has funds exceeding \$5,000,000.

ENGLISHMAN.

TO MAKE PATENT WARMER

APPLETON, WIS., March 26—The Appleton Wonder Dry Heat Co. has been organized at Appleton, Wis., with a capitalization of \$150,000 and will engage in the manufacture of foot warmers, food containers and other articles for tourists and motorists. It has exclusive patents on what is known as a "waterless hot water bottle," consisting of a copper or aluminum receptacle.

By the use of a chemical formula, intense heat is generated within the vacuum between casings when the receptacle is violently shaken for 30 seconds. The heat is retained for five to seven hours and is created without the use of fire, gas or electricity. A factory will be erected at once. The device will retail at about \$5. Alfred A. Archibald of Appleton, the inventor and paterfamilias, will be general manager.

Fisher Body Building Contracts Awarded

Plant at Cleveland to Provide
880,000 Feet Floor Space
—Cost \$5,000,000

NEW YORK, March 31—More than 880,000 sq. ft. of floor space will be provided in the new plant of the Fisher Body Ohio Co., at Cleveland, the construction contracts for which have just been let, at a cost of approximately \$5,000,000, to the Thompson-Starrett Co. of this city. Completion of the projected buildings, on which work will start at once, has been scheduled for Nov. 1, although certain units are to be turned over for the erection of the machinery not later than June 15.

The buildings to be erected are:

Body plant, 74 x 1150 ft., six stories.

Mill building, 500 x 300 ft., two stories.

Crane runway, 40 x 300 ft.

Press building, 120 x 430 ft., 40 ft. in height.

Stock building, 72 x 500 ft., two stories.

Trainshed, 60 x 460 ft.

Details of the construction, which were made public to-day, were that the body plant and the stock building were to be of flat slab reinforced concrete, with the latter structure capable of being extended to six stories. The crane runway and mill building are to have flat slab floors with structural steel frames. Work by the Thompson-Starrett Co. on the mill, kiln and crane buildings is to be completed by June 15, so that the setting of machinery may precede the completion of the body plant, thus permitting, it was planned, the production of material for immediate use in the body structure.

All of the concrete work is to be completed by Oct. 1. As rapidly, however, as each floor is finished, the work of fitting machinery and equipment should be commenced so that production will be started as early as possible.

Rubber Corporation to Combine Three Plants

TRENTON, N. J., March 30—The Rubber Corporation of America has been organized with a capital of \$2,000,000 to take over the Empire and Sterling plants and another in the Middle West. W. M. Pepper is chairman of the board and F. I. Reynolds is president. Vice-presidents in charge of sales are: J. Baker Taylor, eastern section of the United States, Ralph V. Dickinson, central section, and A. W. Fargo, western section.

The company will maintain warehousing facilities at Boston, New York, Philadelphia, Atlanta, Cleveland, Chicago, Kansas City, San Francisco, and, perhaps, at one or two other points.

GASOLINE EXPORTS GROW

WASHINGTON, March 29—Mineral oil exports for February, 1920, show a decided increase as compared with February, 1919. Exports in February of this year amounted to 226,729,124 gal.,

valued at \$34,185,340, as against 165,838,895 gal. worth \$25,513,093 exported in February, 1919. Gasoline exports in February of this year totaled 32,300,057 gal. valued at \$7,917,706, as against 26,964,764 gal. valued at \$6,373,852, shipped in February, 1919.

General Electric Co. Repudiates Circular

NEW YORK, March 31.—The General Electric Co. has sent a notice to its stockholders repudiating all connection with the Steinmetz Electric Motor Car Corp., headed by Dr. Charles P. Steinmetz, chief consulting engineer of the General Electric. The circular says:

"The attention of the officers of the General Electric Co. is being constantly called to the wide distribution among the company's stockholders of a letter from the Steinmetz Syndicate, Mr. J. P. Story, Jr., Chairman, 512 Fifth Avenue, New York, the first paragraph of which reads as follows: 'As a stockholder of the General Electric Co. you will be interested to know that the Steinmetz Electric Motor Car Corp. has been organized, with Dr. Charles P. Steinmetz as chief consulting engineer, for the manufacture,' etc.

"Without expressing any opinion as to the merits of the Steinmetz Syndicate, the General Electric Co. feels it its duty to say that such circular was issued without the knowledge, approval or consent of the General Electric Co. or its officers, and neither the General Electric Co. nor any of its officers is interested in any way, financially or otherwise, in the Steinmetz Syndicate or Steinmetz Electric Motor Car Corp."

Advance-Rumely Shows Big Increase in Trade

NEW YORK, March 30—A marked increase in earnings was shown in the annual report for 1919 of the Advance-Rumely Company, made public to-day. Total profits and income from all sources amounted to \$5,382,149, as compared with \$3,393,703 for 1918. After expenses, Federal taxes and charges there was a balance available for dividends of \$2,401,907. This would be equivalent, after allowance for preferred, to \$12.02 a share on the common, as compared with \$3.19 a share on the common the preceding year.

President Finley P. Mount said:

"Whatever may be the course and outcome of the period of reconstruction, the fact remains that agriculture is and must remain the greatest basic industry of the world. The need for labor-saving machinery on the farm has never been so great as it is now. The tractor particularly has shown its value, not only in the saving of labor on the farm but also in the increased yields produced by the more intensive cultivation made possible by this unit of power farming machinery. The constant increase of power units on the farm creates a greater demand for power-driven machinery."

Farm Truck Buying Shows Rapid Growth

Eastern States Agriculturists Buy
Many Vehicles in Past
Three Years

WASHINGTON, March 29—Farmers in the Eastern section of the United States have been adding motor trucks to their farm equipment rapidly during the past three years, according to figures obtained by the United States Department of Agriculture, which is investigating the use of motor trucks by farmers.

Reports from approximately 1000 farmer truck owners in the New England States, New York, Pennsylvania, New Jersey, Delaware and Maryland during January and February, show that at that time over 80 per cent had owned their machines less than three years. The length of time 955 of these men had owned their machines is as follows: Less than one year, 373; more than one year but less than two, 237; more than two years but less than three, 181; more than three years but less than four, 86; more than four years but less than five, 37; more than five years, 41.

These reports were all from farmers who had purchased new trucks for their individual use. Reports on second-hand machines and on truck attachments for pleasure cars, as well as trucks used primarily for custom work or on regularly established routes, were not included in the count. While it is impossible to determine just how many of the trucks which have been in use only one or two years were purchased to replace other trucks, worn out or discarded, it is known that a large percentage of the reports covers first experience with trucks.

MILWAUKEE COMPLETES LINE

MILWAUKEE, March 26—The Clartotta Mfg. Co., a new \$1,000,000 corporation organized in Milwaukee by O. G. Pfeifer, W. A. Kuebler and Thomas C. Hanson, is engaging in the manufacture of automotive parts and will specialize in clutches for passenger cars and motor trucks. An existing plant has been purchased and equipped, and a force of 125 is now at work on a production of 200 per day.

A single order accepted by the company during the past week calls for the delivery of 100 clutches a day. With the addition of the new clutch plant, Milwaukee has achieved the distinction of manufacturing every part entering into the construction of passenger and commercial cars, being already the largest producer of automotive parts in the world.

RUBBER PLANT UNDER WAY

HARTFORD, CONN., March 26—Foundations have been laid for three of the four new buildings in the Hartford rubber works group of the United States Rubber Co.

Automotive Financial Notes

Hayes Wheel Co.—Annual report for 1919 shows net sales of \$14,686,383, as compared with \$7,655,249 for 1918. Its net profits last year were \$1,501,565, compared with \$531,440 for 1918, leaving a surplus on Dec. 31 last of \$765,565.

Autocar Co.—Directors declared stock dividend of 40 per cent on \$3,000,000 outstanding capital.

Reliance Wheel Co.—Capital increased to \$200,000 of 8 per cent preferred and 25,000 shares no par value common to finance erection of plant on 30-acre site.

Universal Mfg. Co., Des Moines, Iowa.—Incorporated for \$250,000 with H. K. Holden, president, and R. H. Clifton, designing engineer, to manufacture timers for Fords, radiator shutters, transmission locks and luggage carriers.

British-Canadian Machine & Tool Co., Ltd., has taken over Reliance Motor & Tool Co. and International Machine & Tool Co.

Continental Motors Corp. has sold \$5,000,000 7 per cent notes to Chicago bankers and will double its producing capacity.

Willys-Overland Co. announces export orders on books are more than three times as total foreign shipments for any preceding year.

Marsh Motor Car Co.—Capital increased to \$3,250,000 and has new factory under way.

Herschell-Spillman Motor Co. declared extra dividend of $\frac{1}{4}$ per cent in addition to regular quarterly of 2 per cent on common stock.

Marion Tire & Rubber Co., Marion, Ohio.—Reorganized with Allen F. Ayers, Akron banker, as president. Capital increased from \$300,000 to \$750,000.

Hupp Motor Co. declared 2 $\frac{1}{2}$ per cent quarterly dividend on common stock.

Chicago Motor Bus Co.—Involuntary petition in bankruptcy filed by creditors as result of action started by New York bonding company.

Willys-Overland Co.—Stockholders authorize \$25,000,000 increase in common stock, making authorized capital \$75,000,000 common and \$25,000,000 preferred.

Highway Motors Co., Defiance, Ohio.—Incorporated with \$1,500,000 capital, virtually all paid in, to manufacture passenger cars. Incorporators: C. H. Kettering, A. M. Pearson, T. T. Shaw, R. P. Kettering, H. S. Reynolds, J. W. Wright, E. H. Belknap and J. W. Swartz.

Champion Motor Car Co., Cleveland.—Chartered with \$525,000 capital to manufacture and sell motor cars.

Paramount Motor Parts Co., Cincinnati.—Incorporated with \$50,000 capital to manufacture parts and appliances for motor cars.

Cleveland Cam Shaft Co., Cleveland.—Chartered with \$100,000 capital to manufacture cam shafts and other motor parts.

Whitney Tractor Co., Cleveland.—Incorporated with \$1,000,000 capital to manufacture several models of tractors. Incorporators: E. E. McCloud, S. R. Fitzsimmons, M. A. Grady, A. F. Gonder and H. C. Berhous.

Rainier Motor Corp. adds George R. Baker of Chatham & Phenix National Bank, John Nickerson, Jr., and William J. F. Piel to board of directors.

Standard Parts Co.—New board of directors expressed opinion at first meeting that preferred dividend payable April 1 should be deferred until company's permanent financing has been completed and then promptly resumed.

Walker Johnson Truck Co. files certificate with Massachusetts Commission of Corporations increasing capital from \$500,000 to \$3,500,000.

Lansing Stamping & Tool Co. increased capitalization from \$100,000 to \$300,000.

McCord Manufacturing Co. declared usual 1 $\frac{1}{4}$ per cent on preferred stock and of \$1 a share on common. Common dividend represents an increase of 25 cents over preceding quarter.

Ann Arbor Machine Corp. increased capital from \$150,000 to \$500,000. The company recently formed a connection with Fordson Tractor Co. for ensilage cutters, necessitating an expansion in production. E. P. Mills, former Lansing banker, is secretary.

Republic Motor Truck Co., Inc., declared regular quarterly dividend of \$1.75 on the preferred stock.

Hood Rubber Co.—Sales in 1919 aggregated \$22,969,664, an increase of approximately \$600,000 over the preceding year. Surplus of \$2,863,953 at the end of 1919 showed an increase of \$200,000 over the year previous.

Standard Screw Co. will pay the regular quarterly dividend of 6 per cent on common stock April 1.

Dayton Rubber Manufacturing Co. declared quarterly dividend of \$1.75 on preferred stock.

Dearborn Truck Co. declared quarterly dividend of 1 $\frac{1}{4}$ per cent on preferred.

C. M. Hall Lamp Co. declared quarterly dividend of 5 per cent.

B. F. Goodrich Co.—Net sales for 1920 expected to reach \$200,000,000, an increase of about 40 per cent over 1919.

Hartford Auto Parts Co.—Regular quarterly dividend of 2 per cent on the preferred stock.

Republic Motor Truck Co.—Regular quarterly dividend of 1 $\frac{1}{4}$ per cent on preferred stock.

Cincinnati Rubber Co.—Capital increased from \$250,000 to \$1,000,000.

Cyclone Starter & Truck Co., Paris, S. C.—Incorporated with \$1,000,000 capital.

Federal Motor Truck Co.—Will increase capital from \$1,000,000 to \$2,000,000, the increase to be distributed in the form of a 100 per cent stock dividend.

Paige-Detroit Motor Car Co.—Lists earnings before taxes in 1919 at \$2,200,000.

Cadrain Auto Motors Corp., Boston.—Incorporated with \$200,000 capital by Joseph M. Cadrain, George J. Cadrain and Albert L. Ayer.

Southern Automobile Mfg. Co., Memphis, Tenn.—Capitalized at \$1,000,000 to make automobiles, trucks, tractors and tires. W. A. King is president and general manager. Proposes to spend \$250,000 for plant and equipment.

United States Axle Co., Pottstown, Pa.—Organized to manufacture automobile axles.

Peerless Truck & Motor Co.—Declared quarterly dividend of \$1.25 on stock (\$50 par value) making rate 10 per cent annually instead of 8 per cent.

Minerva Engine Co., Cleveland.—Increased capital from \$250,000 to \$1,000,000 to provide manufacturing facilities.

BANK CREDITS

*AUTOMOTIVE INDUSTRIES
begins to-day the publication, under
this heading, of a weekly statement
on the credit situation, prepared
exclusively for this publication by
the Guaranty Trust Co. of New
York, second largest banking insti-
tution in the United States.*

It would be easy to exaggerate the importance, so far as domestic credit is concerned, of the shipments of gold from England. The last ten months have witnessed a net loss of gold by this country of roughly \$350,000,000 in the midst of extraordinary demands for credits.

Whatever the imports of gold in the near future, it is very probable that the prevailing credit stringency will continue for some time. On many hands reports are heard of caution in buying as a reflection of a slackened public demand for articles of consumption; yet both domestic and foreign demand are still heavy, and prospects of profits continue great.

Furthermore, entirely apart from current needs, there are the huge investment requirements of the railroads, other public utilities, the motor and electrical industries, iron and steel, and a dozen other industries.

Of the conditions in the capital market, the lack of real resiliency in the bond market is an index, while the conditions in the current credit market are indicated by the low bank reserves and by high money rates.

CONTINENTAL ISSUES NOTES

DETROIT, March 26—In a letter to stockholders President R. W. Judson of Continental Motors Corp., explains that the issuing of \$5,000,000 of five year 7 per cent notes will "amortize over a period of years the cost of new additions and machinery equipment, provide funds for larger inventories and enable the company to maintain substantial cash reserves" without using bank lines of credit.

Men of the Industry

Harry L. Bill, manager of manufacturing and production for the Winton Motor Car Co., has resigned to become vice-president and general manager of the Saxon Car Co. He was with the Chalmers Motor Co. before going with Winton, and is considered an authority on shop management and production.

F. G. Allen, former president of Moline Plow Co., is president of the newly organized Engineering Development Co., Moline, Ill. Associated with him are **T. B. Funk**, chief engineer of Moline tractor branch, and **C. M. Eason**, former manager of the tractor bearing division of Hyatt Roller Bearing Co. Eason is general manager of the new company.

W. B. Mertens has been elected chief engineer of Friend Motors Co.

D. C. Selheimer, formerly of Packard Motor Car Co., has become works manager of LaFayette Motors.

John Perkins, late superintendent of Packard truck division, has been appointed production manager of Lewis-Hall Motors Corp.

Ralph S. Allen, general salesmanager of Duratex Co., Newark, N. J., has been promoted to vice-president and member of board of directors.

J. R. Adair has been appointed manager of the Racine branch house of J. I. Case Plow Works Co.

Godfrey H. Atkin has been appointed Western district manager of Electric Storage Battery Co., in charge of all departments in Chicago, St. Louis, Kansas City, Minneapolis and Denver.

S. K. Miller has been elected vice-president of the Kentucky Wagon Mfg. Co. He has been general salesmanager since 1918.

S. W. Steinberg has become publicity director of Rainier Motor Corp., succeeding Putnam Drew.

C. G. Germaine, who has represented the Standard Welding plant of Standard Parts Co. in the Western territory, has resigned to become Western representative of Kelley Metals Co., with headquarters at Chicago.

A. L. Ellis, formerly with spring division of Detroit Steel Products Co., has been appointed production manager of Jenkins Vulcan Spring Co.

C. M. Wood, formerly sales engineer of H. W. Johns-Manville Co., has assumed charge of the recently established Good Roads Bureau of Goodyear Tire & Rubber Co. He has had wide experience in road engineering and highway construction.

C. L. Sonen has resigned as production manager of Teetor-Hartley Motor Corp., Hagerstown, Md., to organize the C. L. Sonen Co., industrial manufacturing engineers, located in Indianapolis.

Otto L. Lewis, who has been connected with Southern Motor Mfg. Assn., Houston, Tex., in the development of a motor cultivator, has retired to construct a line of power farming machinery suitable to Southern conditions.

Courtney Johnson, production manager of Dort Motor Car Co., has been made assistant to general manager **D. M. Averill**. **H. F. Whitmore** succeeds Johnson as production manager.

J. R. Van Cleve, former service manager of Dort Motor Car Co., has purchased an interest in the Commercial Motor Car Co. of Memphis, Dort dealers.

L. Clayton Hill, for eight years connected with Packard in chassis design work and as body and airplane engineer, has opened offices in Detroit as consulting engineer, specializing in the automotive field.

W. G. LeFevre, for several years special representative for the Kelly-Springfield Motor Truck Co., has resigned to become general salesmanager for Tower Motor Truck Co., Greenville, Mich.

E. J. Cahill has been made service manager of the Trask Kennedy Co., Detroit distributor of Stanley steam cars.

Don C. Prentiss, formerly assistant general salesmanager of Packard, now is general sales and advertising manager of the W. R. Johnston Manufacturing Co., Chicago.

L. M. Smith and **C. J. Craven** have been appointed production manager and manager of stock department, respectively, of Detroit Transportation Truck Co., Monroe, Mich. Both formerly were connected with the Standard Truck Co.

J. H. Dutch has been made special representative of the manufacturers' sale department of the Firestone Tire & Rubber Co., with headquarters at Detroit.

H. M. Wirth, who has been treasurer of the Liberty Motor Car Co. since its organization, has resigned to become associated with the Kelsey Wheel organization.

H. J. Butler has been appointed salesmanager for the Oneida Motor Truck Co., Green Bay, Wis., replacing **C. J. Welch**. He formerly was with Edison Storage Battery Co. as Chicago manager.

M. W. Reed, engineer in the truck division of the Paige Motor Co., will engage in retail sales for the Paige company on April 1.

C. W. Butterfield, for the past four years connected with the Dyneto Electric Corp. of Syracuse, has been appointed salesmanager of the Herschell-Spillman Motor Company, North Tonawanda, N. Y.

George O. Starr has resigned as salesmanager of the Murray Motor Car Co.

F. L. Waite, who resigned recently as advertising manager of Reo Motor Car Co., has joined the organization of the New-Way Motor Co. in the sales promotion department as advertising manager.

Paul E. Ryan has been appointed manager of the Perfection Spring Co. of the Standard Parts Co. of this city. Mr. Ryan formerly was production director for the Aluminum Castings Co.

William E. Hutchinson, formerly of the Edward Valve & Mfg. Co., East Chicago, Ind., and the Denby Motor Truck Co. of Detroit, has been appointed purchasing agent, of the Beneke & Kropf Mfg. Co. of Chicago, manufacturers of the Rayfield Carburetor.

BAUER SUCCEEDS COBLEIGH

NEW YORK, March 29—George F. Bauer, commercial agent in the New York office of the Bureau of Foreign and Domestic Commerce, has been engaged as secretary of the Foreign Trade Department of the National Automobile Chamber of Commerce. His specialties have been the tariff and foreign statistics.

Bauer succeeds **H. R. Cobleigh**, who has been appointed secretary of the new service department established by the N. A. C. C. to bring about an extension of standardization and better service conditions in automobile plants and in the stations of their distributors and dealers.

CHICAGO TOOL MOVES OFFICE

NEW YORK, March 29—General offices of the Chicago Pneumatic Tool Co. will be transferred to this city April 1. They will be located in the Chicago Pneumatic Building, a new ten-story structure at 6 East Forty-fourth Street. Carefully laid plans made it possible to move the organization without disrupting business.

DURATEX BREAKS GROUND

NEWARK, N. J., March 29—Duratex Co. has broken ground for new buildings which will provide 100,000 additional feet of floor space. Branch offices have been established in some of the principal distributing centers, including Detroit and Chicago, and representatives for foreign countries are being appointed.

E. & W. ADDS TRAILER LINE

MILWAUKEE, March 29—The E. & W. Mfg. Co., for several years manufacturing attachments for converting passenger car chassis into motor trucks, is now building trailers in various styles and sizes. It is the first trailer plant to be established in Milwaukee.

CASE LIMITS PRODUCTION

RACINE, WIS., March 27—Only a limited number of the four body models of Model V Case cars will be produced this year, it is announced by the J. I. Case Threshing Machine Co. The total will be approximately 3500, of which about one-third will be closed cars.

Calendar

SHOWS

April 21-28—San Francisco. National Aeronautic Exposition. Exposition Auditorium.

Oct. 6-16—New York. Electrical Show. Grand Central Palace. George F. Parker, Manager.

FOREIGN SHOWS

April 2-May 4—Buenos Aires. Exposition of U. S. manufacturers.

May 15-June 13—Cars, Parts and Accessories. Antwerp.

June 26-July 25—Commercial vehicles, tractors, camions and engines. Antwerp.

July 9-20—London, England. International Aircraft Exhibition. Olympia. The Society of British Aircraft Constructors.

Aug. 7-Sept. 15—Motorcycles, sidecars, etc. Antwerp.

October—London. Commercial Vehicle Show. Olympia.

November—London. Passenger Car Show. Olympia.

CONTESTS

May 1—Hanford, Cal. Dirt track.

May 31—Indianapolis, Ind. Speedway.

May 31—Brockport, N. Y. Dirt track.

June 1—Omaha, Neb. Truck Reliability Run.

June 12—Uniontown, Pa. Speedway.

June 17—Portland, Ore. Dirt track.

June 19—Ogdensburg, N. Y. Dirt track.

July 4—Tacoma, Wash. Speedway.

July 4—Hanford, Cal. Dirt track.

July 4—Spokane, Wash. Dirt track.

July 5—Batavia, N. Y. Dirt track.

July 17—Warren, Pa. Dirt track.

July 24—Watertown, N. Y. Dirt track.

July 31—Fulton, N. Y. Dirt track.

Aug. 7—Erie, Pa. Dirt track.

Aug. 14—Buffalo, N. Y. Dirt track.

Aug. 21—Johnstown City, Pa. Dirt track.

Aug. 28—Canandaigua, N. Y. Dirt track.

Aug. 20-21—Middletown, N. Y. Dirt track.

Aug. 27-8—Flemington, N. J. Dirt track.

August, 1920—Paris, France. Grand Prix Race. Sporting Commission Automobile Club of France.

Sept. 1—Glidden Tour—N. Y. to San Francisco.

Sept. 6—Hornell, N. Y. Dirt track.

Sept. 6—Cincinnati, O. Speedway.

Sept. 6—Uniontown, Pa. Speedway.

Sept. 17-18—Syracuse, N. Y. Dirt track.

Sept. 25—Allentown, Pa. Dirt track.

Oct. 1-2—Trenton, N. J. Dirt track.

Oct. 8-9—Danbury, Conn. Dirt track.

CONVENTIONS

April 27-29—Atlantic City. Increased Production Convention, Chamber of Commerce of the United States.

May 9-12—Independent American Petroleum Congress, Congress Hotel, Chicago.

May 12-15, 1920—San Francisco. Seventh National Foreign Trade Convention.

May 20-30—Atlantic City. Third American Aeronautic Congress, Aero Club of America.

June 22-25—Asbury Park, N. J. Annual meeting American Society for Testing Materials.

S. A. E. MEETINGS

April 7—Minneapolis Section Meeting. Subject—Tractor Weight and Drawbar Pulls.

April 8—Metropolitan Section, Automobile Club of America, New York. Subject—A Study of Tire Deflection and Unsprung Weight in Trucks. Speaker, A. F. Masury. Illustrated.

June 21-25—Ottawa Beach. Mich. Summer Conference.

Truck Sales Managers Plan Trade Expansion

CHICAGO, March 27—The National Association of Motor Truck Sales Managers, in a meeting at the Congress yesterday and to-day, gave particular attention to the expansion of business through better business and selling methods among dealers.

It was recommended that dealers install cost systems, increase their sales efficiency and eliminate price-cutting as methods of building a successful foundation under the manufacturing of trucks.

A committee will be named to confer with a committee from the N.A.C.C. on the matter of truck shows. So far as any preference was expressed it was for a show held at the same time as the car show, but in a downtown location.

The Motor Truck Manufacturers' Association also met and heard plans for work outlined by David Thomas, the new secretary. The manufacturers will meet again April 3, probably at the Congress in this city.

G. M. C. SAVINGS A SUCCESS

NEW YORK, March 29—Gratifying results from the first year of its operation of an employees' savings and investment fund are reported by General Motors Corp. Early in 1919 the company created a fund in which any employee could deposit \$5 or multiples thereof up to 10 per cent of his annual wage, but not to exceed \$300 a year. The plan provides that the corporation match each employee's savings by crediting his account with an amount equal to his deposits, paying interest on the total at the

rate of 6 per cent per annum, computed semi-annually. A new class is started each year to terminate in five years.

In the remaining months of 1919, while the plan was in operation, 33,641 employees put into the class of 1919 \$2,250,000. In the five years to Dec. 31, 1924, the company will match these savings dollar for dollar and credit interest semi-annually at the annual rate of 6 per cent.

Smith Springfield Succeeds Body Company

SPRINGFIELD, MASS., March 30—The Smith Springfield Body Corp., successors to the original Springfield Metal Body Co., first builders of the "Springfield Tops," and pioneers in aluminum bodies, has obtained a factory at West Springfield and will begin deliveries June 1 of high grade aluminum bodies which will be its exclusive output. The factory is 500 x 90 ft.

Hinsdale Smith is president of the company, Major Arthur P. Smith, treasurer, and Lieut. Col. C. S. Dame, secretary. The directors include Harry G. Fisk, treasurer of the Fisk Rubber Co., and L. de F. Munger.

NATIONAL GAGE UNIT READY

LA CROSSE, WIS., March 29—The National Gauge & Equipment Co. of La Crosse, Wis., expects to occupy a new factory addition of 30,000 sq. ft. about April 15 or May 1. It is 135 x 253 ft. and doubles the factory space. The concern is one of the largest makers in the country of automotive equipment specialties.

New Jersey Imposes Surcharge on Car Tax

NEWARK, N. J., March 29—Through the efforts of dealers and the Motor Truck Club of New Jersey, the proposed increase in motor truck licenses, which in heavier truck cases amounted to 100 per cent, has been modified to a surcharge of 20 per cent on the existing fee for all licenses during 1921.

Passenger cars are also affected by the surcharges, which in their case, supersede a proposed tax of \$1 per horse power. In pursuance to the legislative plan in substituting the surcharge for the tax on horse power, the legislature will appoint a commission to report at the next session a uniform motor vehicle law. The commission will be made up of all organizations affected.

An idea of the work accomplished by the dealers and truck club in obtaining the compromise fees, may be seen in the fact that the proposed license for trucks 24,001 lb. and over (loaded) was \$250. Under the fees agreed upon it will be \$70.80. Similar reductions were obtained on all trucks proportionately to their weight.

ATLANTA WOMEN BOOST ROADS

ATLANTA, GA., March 27—The Atlanta Woman's Club has organized a good roads committee to co-operate with the various automotive associations of the State and the civic and commercial organizations to secure a bond issue of \$40,000,000 or \$50,000,000 for the construction of good roads in the State of Georgia.

AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

VOL. XLII

NEW YORK—THURSDAY, APRIL 8, 1920

No. 15

Italian Plane Makers Seek World Aviation Sales

Reports to the Bureau of Commerce show that, while American companies have done but little in the foreign fields, the Italians have gone ahead with vigor. Similarly their plans for interior air lines are large and promise much for civil flying

SINCE the armistice, Italian manufacturers have gone ahead with many plans for the development of aviation, not only in Italy but throughout the world, according to reports received by the Bureau of Foreign and Domestic Commerce. Italian machines have been sent to practically all of the important countries and numerous aerial routes have been opened or will be within a short time.

When military orders ceased, the smaller manufacturers abandoned production, but the larger companies, possessing adequate resources for carrying on experimental work, immediately undertook the study of new types of planes used for commercial purposes. In this group are included: Fiat, Ansaldo, S. I. A. I., Macchi, Caproni and a few others of minor importance. While the problem of commercial aviation is a difficult one, there is no doubt that these companies, which possess all the necessary facilities, including excellent technical plants and well-trained labor, in addition to aeronautical engineers of the highest caliber, will be gradually able to achieve success. Care is being given to the selection of materials, and the tendency is to substitute metal for many wood parts.

The Fiat company has developed a new type, known as B-R, of which the Italian Government has already ordered seventy. This plane is equipped with a 600-hp. engine and has a speed of 154 m.p.h. Its carrying capacity is 2204 lbs.

Ansaldo has also brought out a new type, A-5, equipped with a 300-hp. engine, having a speed of 124 m.p.h. and a flying radius of 1242 miles. It is adapted for postal service or passenger transportation. The S. I. A. I. has devoted itself to seaplanes.

Several new models have been produced by the S. A. Nieuport Macchi, which lost no time in devoting itself to civil aviation. Its former M-9 has been modified to provide the new M-9 bis, which contains comfortable accommodations for five passengers. Its has a flying radius of 338 miles and, equipped with a 250-hp. engine, has a speed of 99 m.p.h. A second new type is the M-9 ter, also adapted for passengers and goods. This type is equipped with a 300-hp. engine, giving it a speed equal to that of M-9 bis, that is, 99 m.p.h. The latest model is the small M-16, a 30-hp. plane intended for individual flying. It is considered one of the most successful attempts so far made to provide a practical small machine for ordinary use.

The Caproni company is experimenting on a large scale with its biplanes and triplanes. Specific information is not available but it is known that machines will be produced to carry from 10 to 100 passengers.

For the purpose of canceling military contracts and liquidating stocks of materials, aviation was put in charge of H. E. Conti, Undersecretary of Arms and Munitions. This was a temporary expedient, intended

to bridge over the transition period. The Italian Government has long taken an active interest in aviation from the standpoint of its development for practical uses. Immediate steps were taken to study the routes best adapted for aerial service and the most suitable planes. The liquidation was practically completed in June, 1919, and a radical change soon was made in the organization of the Air Services. Military and naval aviation was left in the hands of the respective authorities who, however, obtained their equipment from the new Department of Civil Aviation, created July 1, 1919. The administration of all aviation activities, except military and naval, was vested in a new General Direction of Aviation created in the Ministry of Transportation. The personnel of the new department, however, is essentially military and operates as such. Its future status has not been definitely decided.

The functions of the General Direction of Aviation were officially stated as follows in the decree by which it was created:

1. To control civil aviation, both public and private, and to administer the civil services of the State.
2. To organize and maintain air routes, landing-grounds and subsidiary establishments, not military, and, with regard to military landing-grounds, to make the necessary provisions to apply general aerial regulations.
3. Technical and practical studies and experiments.
4. The testing, supplying and administration of aeronautical material.
5. The establishment of schools for training pilots and the technical personnel required, except those having a military character.
6. The concession and supervision of public services of aerial transportation.
7. The conclusion of international agreements and the sending abroad of aviation missions.

The activities of the new Aviation Department have so far been organized in the following manner:

- (a) Experimental aviation: Headquarters at Montecelio. Fields at Montecelio and Vigna di Valle. A section at Mirafiori.
- (b) Technical aviation: Headquarters at Rome. Sections at Milan, Turin, Genoa and Naples.
- (c) Aerial routes: Headquarters at Rome. This is divided into two sections, one controlling the service of aerial communications, with its headquarters at Cento Celle, near Rome, and the other the construction of aeronautical buildings, with offices at Turin, Milan, Florence and Rome.
- (d) The Direction of Schools: Fields at Castina, Costa Ponte, S. Pietro, Orbetello, Venaria Reale, Foggia Sud and Gioia del Colle. Schools at Turin.
- (e) The Supply of Aviation Material: Headquarters at Turin. Sections at Milan, Pire Firoi, Pisa and Naples. Depots at Parma, Piacenza and Bologna. A repair station at Asti.
- (f) Transportation: Headquarters at Turin. A detached office at Milan.
- (g) An aerological service at Rome.
- (h) A Director of the Supply of Provisions, with headquarters at Turin and sub-sections at Naples, Genoa and Milan.
- (i) Experimental institution for dirigibles and balloons, Rome.

(j) An establishment for the construction of dirigibles and balloons, Rome.

(k) Medical experimental service.

In its plans for commercial aviation, the Italian Government has proceeded cautiously. It was considered that failure would have a depressing effect on the general attitude toward civil aviation; consequently only a little has been done to actually establish routes, although exhaustive studies were begun soon after the armistice. A number of flying squadrons were organized for an experimental study of the routes proposed and constant flights have been made and records compiled of atmospheric conditions, prevailing winds and other factors. Much valuable information has been gathered.

The airdrome of Cento Celle, near Rome, is the headquarters of the experimental group and special attention has been paid to the route from Rome to Naples. Routes such as this model possess a telephone station each 15 miles and an airdrome with spare parts, supplies of all kinds and automobile transportation at each 124 miles. The principal through route exhaustively studied is Nice—Geneva—Pisa—Rome—Naples—Foggia—Brindisi—Otranto, and its logical extension: Vallona, Salonica, and Asia Minor. Another route has been considered which, coming from Central Europe, would pass through Milan, Piacenza, Bologna, Ancona, joining the first route at Foggia.

In connection with aerial mail service, a route from Rome to Sardinia has been under consideration, but trial flights indicated that a direct route across the sea was too long to be practicable and negotiations were commenced with France for a route from Rome to Sardinia, touching at Elba and the French island of Corsica. It is believed that a satisfactory agreement will be reached in this connection.

The only air routes definitely established are given here. Their operation has now, however, been temporarily suspended.

Mainland—Milan—Pisa—Rome.

Sardinia—Terranova—Macomer—Cagliari (Mon-serrato). Cagliari (Mon-serrato)—Macomer—Sassari. Terranova—Chilivani—Sassari.

From Milan to Pisa a Caproni machine was employed, and from Pisa to Rome three S. V. A. airplanes.

The following are the routes on which it is hoped to begin operations soon:

Mainland—Milan—Piacenza—Bologna—Ancona—Foggia. Nice—Genoa—Pisa—Rome—Naples—Foggia—Brindisi. Rome—Terni—Ancona. Turin—Milan—Verona—Udine—Trieste.

Sicily—Catania—Terranova—Mazzara del Valle—Palermo.

Other routes which have been given consideration are:

Genoa—Turin	Bologna—Padua	Trieste—Lubiana
Turin—Piacenza	Verona—Innsbruck	Florence—Bologna
Geneva—Milan	Udine—Lubiana	Naples—Catania
		Mazzara del Valle.

Proposed branch routes are:

Verona—Venice.

Venice—Arcade (route Turin—Trieste).

Torretta (Milan)—Bellinzona.

Brindisi—S. Lucido (route Naples—Mazzara del Valle).

Moncenisio—Turin (route Turin—Trieste).

In addition, it has been announced that twenty airplanes have been shipped from Brindisi for establishing

an aerial service in Erithrea and Somaliland. The central station will be at Keren, from which the first route to Massaua, it is hoped, will soon be in operation.

The first actual agreement made by Italy in connection with the establishment of international aerial postal service, was that concluded with Greece early in 1919. This agreement provided that an airplane service would be established for the transportation of the official and private correspondence of the two countries and a temporary tariff was agreed upon as follows:

For letters, lire 2.50 for each 20 grammes or fraction thereof.

For postcards, lire 1.00.

For commercial matter, lire 1.25 for each 50 grammes or fraction thereof.

For printed matter, lire 0.25 for each 50 grammes or fraction thereof.

It was arranged that special means of rapid transportation would be provided for the concentration of matter intended for aerial transportation at the point of departure and at landing-places and that free delivery would be made by the ordinary means of transportation throughout the entire territory of the two countries, special delivery being made at the final destination. The transportation of passengers also was authorized. It is understood that the service between Italy and Greece will be begun within a short time.

Definite steps are being taken in Italy to promote civil aviation. The *Lega Aerea Nazionale*, recently organized, announces that in April, 1920, a competition will be held for machines suitable for aerial touring, of which a number of models have already been prepared. It is also interesting itself in the question of an "aerial motor-

bicycle," or small machine, with an engine of not over 12 hp. A special commission has been appointed, composed of well-known aviators, which will have charge of a second competition for this type of machine. A first prize of 50,000 lire and a second prize of 10,000 lire will be offered for each of the two following classes: 1. Machines equipped with engines up to 350 cu. centimeters of cylinder capacity, which must perform only a horizontal flight of several hundred meters. 2. Machines having engines up to 500 cu. centimeters of cylinder capacity, which must rise from the ground within 492 ft., reach an altitude of 328 ft., cover a distance of at least 1640 ft. at a speed not over 27 miles per hour and perform an evolution in the shape of the figure eight. The competition, which will be international, will take place in September.

No organized exportation of airplanes from Italy has so far taken place. Italy hopes, however, to be an important factor in this branch of international commerce and the Government has taken definite steps to make known the advantages of Italian aircraft throughout the world by the appointment of a number of special air attachés and the dispatch of special missions to various countries. These missions were provided with machines by which demonstration flights were made. Air attachés are now stationed at Washington, London, Paris, Brussels, Rio de Janeiro, Panama, Athens, Constantinople and Peking. Special attention has been devoted to South America, where the most important flight which was held was that made by an S. V. A. machine over the Andes, from Buenos Ayres, Argentina, to Santiago, Chile. Recently four hydroplanes were presented to the Government of Argentina by the Italian Government, as a token of Italy's regard for Argentine aviation.

The Commercial and the Military Plane

TOO many conclusions have been drawn from attempts to find a commercial use for war-time equipment not designed for commercial efficiency, the Army Air Service stated recently. The principles of design for war equipment are almost dramatically opposed to those underlying the development of commercial equipment. In war the need is so desperate that production and operation costs are hardly considered, while for commercial needs both are of paramount importance. Aircraft as a means of transportation and communication must follow the laws of development of other means of transportation and communication and must be so designed as to give the desired service as cheaply as is consistent with efficiency and safety.

War machines must possess great speed and at the same time be capable of climbing rapidly, characteristics which are opposed in design. The desired result is gained by a compromise design and the installation of an excess powered engine. They must operate at sea level and at high altitude equally efficiently. This requires a complicated cooling and carburetion system, which adds tremendously to operation and production costs and is not necessary for many commercial machines. War planes must be very maneuverable at a sacrifice of stability and safety and the comfort of passengers is limited to the point of efficient performance of duty.

When an intelligent survey of the needs for rapid and convenient transportation and communication has been made and designers can tell definitely what service is required for their planes and what limit to production and operation costs will be set for this service, they will be able to produce equipment which will be as efficient commercially as the present equipment is for war. There exists

today in the United States enough unapplied knowledge gained as a result of our war expenditure on aeronautics to make that expenditure an excellent investment rather than the dead loss it appears to be to-day.

The Aircraft Year Book

THE American airplane, balloon and aviation industries, as they stand to-day, are explained and described at length in the valuable Aircraft Year Book for 1920, recently issued by the Manufacturers' Aircraft Association. Many interesting chapters, including photographs and statistics, are included within the covers of this new book, which was gotten out by Doubleday, Page & Co., and it should be widely read.

For instance, it lists all the permanent and emergency landing fields in this country, gives the status and models of the makers belonging to the association, and, in addition to brief sketches of war-time developments, reviews the leading aviation events of the preceding year, both official and unofficial. There are many other chapters in its very readable 333 pages, constituting first of all a history and a summing up of aviation as it is to-day.

A RECENT circular of the National City Bank, New York, states that production must be increased and consumption must be decreased, if the world is to be brought back to anything like a normal economic condition. This applies, says the circular, especially to America, where there is underproduction and a growing inefficiency among producers.

Four and Six Cylinder Engines in Passenger Car Line

In line with present requirements, the Herschell-Spillman company has developed two new engine models, the four having 192.4 cu. in. displacement and the six having 248. An interesting feature is that the cylinders and top half of the crankcase are cast in a single block.

IN line with the present-day requirements of automobile manufacturers, two new passenger car engines, one a four and the other a six, have been developed recently. The smaller model has a piston displacement of 192.4 cu. in., attaining 35 hp. at about 1900 r.p.m., while the larger, which develops 58 hp. at about 2000 r.p.m., has a displacement of 248 cu. in. Both engines have all the cylinders and the top half of the crankcase cast in a single block and use a pressed steel lower half. The makers, the Herschell-Spillman Motor Co., have built the four for thermosiphon circulation, the six being fitted with a centrifugal circulating pump.

The four-cylinder model has a bore of $3\frac{1}{2}$ in. and a stroke of 5 in., giving a piston displacement of 192.4 cu. in. A horsepower curve published by the company shows a peak load of 35.5 hp. at 1900 r.p.m. This output was obtained with the following equipment: $1\frac{1}{4}$ -in. Zenith carbureter, Bosch magneto, and A. C. spark plugs. The compression volume is 21 per cent of the combined piston displacement and clearance volume.

The engine is designed for three-point support, having two supporting arms cast integral with the flywheel bell housing and the third supporting member in the form of a trunnion on the cam gear housing concentric with the crankshaft.

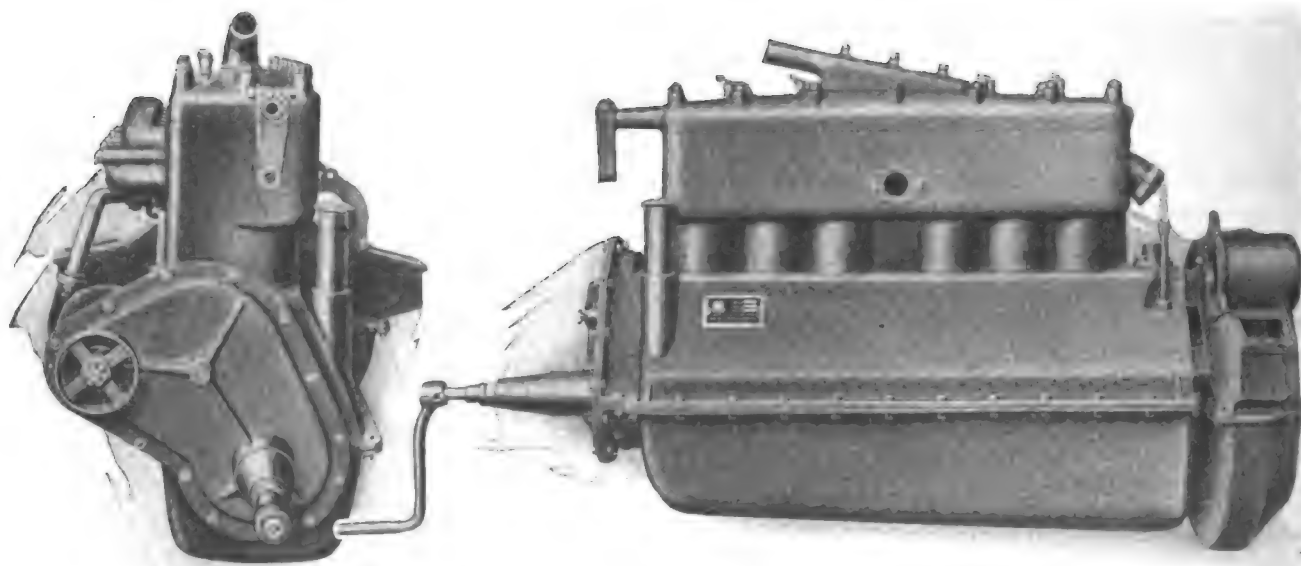
Pistons are made of cast iron, $3\frac{3}{8}$ in. long and fitted with three rings $\frac{3}{16}$ in. wide each. Connecting rods are I-section drop forgings measuring 11 in. between centers. The piston pins are of the usual hollow, case-hardened

type, $\frac{7}{8} \times 3\frac{1}{4}$ in., fastened in the piston bosses and journaled in phosphor bronze bushes in the upper end of the connecting rods, which bushes are $1\frac{7}{16}$ in. long. The crankshaft is 2 in. in diameter, both on the crankpins and the main journals, the former being 2 in. long and the latter (of which there are two) 4 in. There are three bearings on the camshaft of the following dimensions (front to rear): $2\frac{1}{16} \times 2\frac{7}{8}$ in., $2\frac{1}{32} \times \frac{7}{8}$ in., $1\frac{1}{8} \times 2\frac{1}{8}$ in. Between bearings the camshaft has a diameter of $\frac{1}{16}$ in. All bearings on the crankshaft are of the bronze back, babbitt-lined type. The camshaft drive is by helical gears of 9 in. diam. pitch by $1\frac{1}{8}$ in. width of face.

The valves have a clear diameter of $1\frac{9}{16}$ in. and a lift of $\frac{5}{16}$ in. They are operated by push rods with mushroom type cam followers and screw and check-nut adjustment for clearance. An interesting feature is the arrangement of the pushrod guides, which tends to easy production. These guides are cast integral with plates bolted to the side of the engine over the valve stem compartment.

There is a $1\frac{1}{4}$ -in. carbureter boss at the side of the engine opposite the valves, suited to an S.A.E. standard side outlet carbureter. In view of the use of thermosiphon circulation, the water connections are very large—2 in. in diameter. A combined inlet and exhaust manifold is fitted that is bored for a 2-in. outside diameter exhaust pipe.

Lubrication is by a combined force feed and splash system. To the crankshaft main bearings and the end

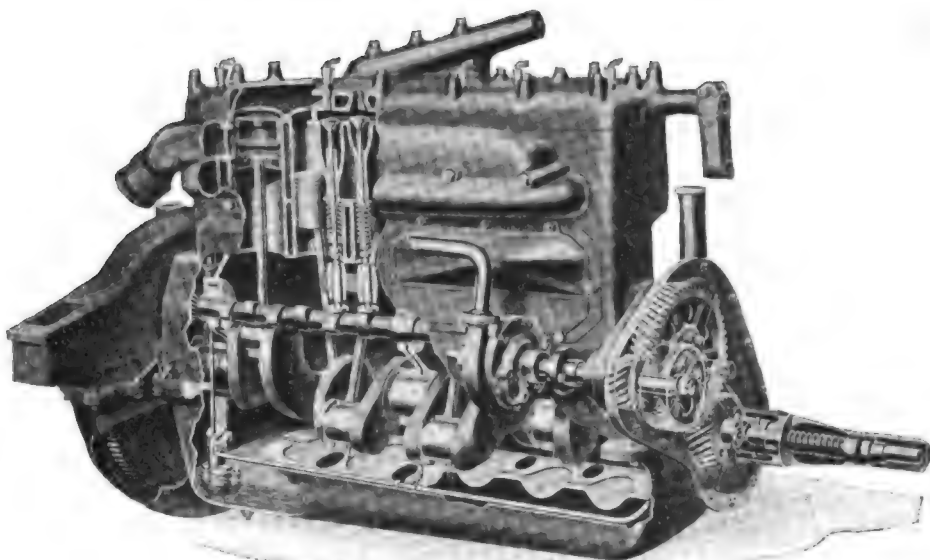


Rear and left side views of the Herschell-Spillman six-cylinder engine

bearings of the camshaft, the oil is forced under pressure by the gear type, gear-driven pump, and there is direct feed to the gear housing. All other bearing surfaces are lubricated by splash.

The fan bracket is of the cranked type, is supported by the cylinder head and permits of making adjustments of the belt tension. The flywheel weighs 55 lb. and has the starter gear cut on it, consisting of 138 teeth of 8-10 pitch. Either a No. 3 or a No. 5 S.A.E. bell housing can be furnished, with a No. 2 starting motor mounting flange. The former bell housing is suitable for the outboard and the latter for the inboard Bendix drive. The weight of the engine is 440 lb.

The six-cylinder engine has $3\frac{1}{4} \times 5$ -in. cylinders. It develops a maximum of 58 hp. at 2050 r.p.m., and is fitted with a Zenith $1\frac{1}{4}$ -in. carbureter, Bosch magneto, variable spark and A. C. plugs. The compression volume is 21 per cent. Valves are of $1\frac{9}{16}$ in. clear diameter by $\frac{5}{16}$ in. lift. A similarity in the dimensions of the six and four-cylinder is noticeable, which is an advantage from the manufacturing as well as the service viewpoint. Thus the crankpin bearings, the piston pin bearings and the camshaft bearings are the same size on both models. The six-throw crankshaft has three main bearings, of $2\frac{9}{16}$ in. outside diameter and $2\frac{1}{8}$ in. bore, the lengths being 3, $2\frac{5}{8}$ and 4 in., front,



Right side, partly cut away, of the six-cylinder Herschell-Spillman engine

intermediate and rear, respectively. The same connecting rod is used as in the four-cylinder engines, which reduces the number of different parts.

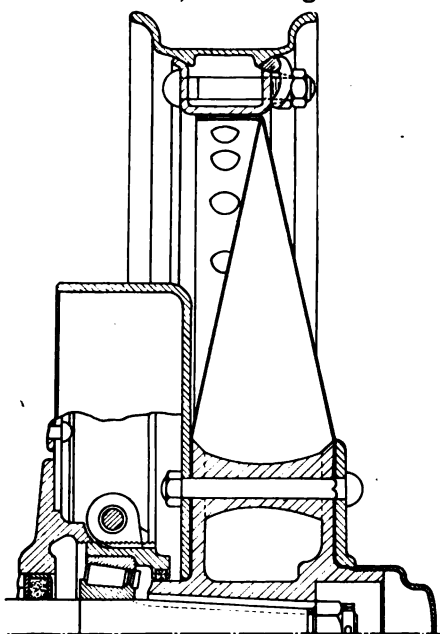
Pistons are $3\frac{1}{2}$ in. long and have three $\frac{3}{16}$ in. rings. Cooling is by centrifugal pump with $1\frac{1}{4}$ -in. o. d. water inlet to the cylinder block and $1\frac{1}{2}$ -in. outlet. Lubrication is the same as on the four. The flywheel is cut with 138 teeth of 8-10 pitch (17.25 in. pitch diameter) and is enclosed in an S.A.E. No. 3 bell housing.

The weight of the six-cylinder engines is 563 lb.

New Double Disk Wheel

THE accompanying cross-sectional view shows a double disk triangular form of rear wheel, equipped with a Firestone demountable rim and mounted on a Timken axle. The outer edges of the disks are bent over and form wide flanges, one beneath the other, so as to give mutual strength and support, and are riveted to the felloe band with $35\frac{5}{16}$ channel rivets, 2 in. apart. The valve stem is placed at the back of both sheets, in an indentation or recess, where the inflating nozzle can be readily applied. The designers and manufacturers are the Indestructible Wheel Co.

Among the advantages claimed are that they do not swell, shrink or warp, that they do not collect or carry mud, snow or ice, that they are easily



Disk wheel construction of the Indestructible Wheel Co.

kept clean; that they are not affected by climatic changes and that they do not become noisy on account of internal stresses which might in time cause trouble. Large disk areas distribute shock forces and diminish fiber stresses. Owing to the symmetrical lines, the wheel is readily painted and kept looking new, there being no obscure corners where paint cannot penetrate, a circumstance which not only adds to the appearance, but also acts as a protection against rust and weathering.

Oil-Easy Spring

A NEW design of spring which can be readily lubricated has been devised by A. E. McManus, Jr. The lower edge of one side of each spring leaf is ground away or rolled to a taper so as to form a groove. It is claimed for this construction that rust and the resulting pits and ridges are eliminated and that friction is increased through the introduction of dust and dirt between the leaves. The grooves are accessible and the spring can easily be oiled at any time. Oil injected into the grooves penetrates the width of the leaves and every part of every leaf is thus reached. Oiling is required only once every six weeks or two months.

THE potential output of petroleum from the wells of Mexico is, according to information furnished by the Secretary of Industry and Commerce, equivalent to over 250,000 cubic metres daily, but the actual output is only about one-tenth of this amount.

A Sedan Body to Meet the Present Day Requirements

The elimination of undesirable features has finally brought about the construction of enclosed bodies that meet the demands, but changes yet are necessary to keep pace with popular wishes. Consequently, Mr. Mercer has worked out a design that is worthy of study by body builders.

By George J. Mercer

CLOSED body types are few in number and, except for the town car bodies used in large cities in limited numbers, there are really no models except the coupes and sedans. The latter is by far the most satisfactory yet offered to the public; it has been the product of slow elimination of undesirable features, and the public and the manufacturer have been jointly educated until the product meets the requirements.

Competition in business and the desires of the buyer, however, continually force changes, even though the model is apparently all right, because, when a model becomes stereotyped, it begins to lose its attractiveness. For instance, the sedan, for a time, was made with the slanting front, but we are slipping rapidly away from this, as was evidenced at the last show. The reason is simply for change, because the slant front had many desirable features.

The newest feature was the elimination of the glass visor and the substitution of an opaque one. The difficulty of getting glass and the need to shield the driver from the sun's rays were the primary points bringing this about. It is being generally adopted and meets real conditions.

One of the changes made in the design here illustrated is a development of this principle, a hood having been added in place of the fabric visor. This not only gives protection on the top, but it has the additional protection of the sides. Without being too much of an extension to interfere with the vision, the hood can be operated from the inside by rods in the same manner as some glass visors are operated and without trouble can be raised to the position, as indicated by the dotted

lines on the outline side view on the opposite page.

This hood is formed of a $\frac{3}{8}$ in. steel rod with an eye at each lower end that forms the hinge. Near the upper end on each side, the guide rods are attached that enable the driver to open and close the hood from the inside of the car.

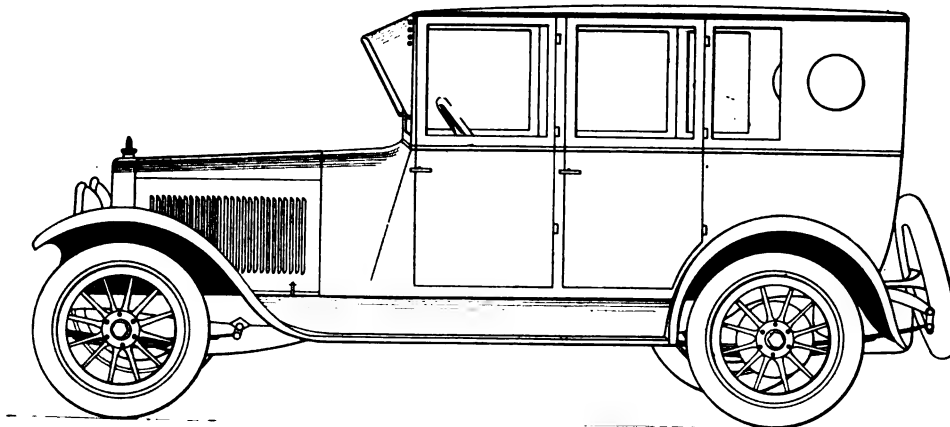
These operating rods are the conventional straight rods that have been used for years to operate the storm visor, except that they must be reversed, as the action of the hood in closing is opposite in its action to that of the glass visor. These operating rods serve to keep the hood stationary in any position, as well as keeping it rigid against the wind pressure when forward.

The covering is made from any flexible waterproof fabric, black in color, and should be selected from goods that will not show creases when folded. It is fastened solid to the pillars and top rail of the body. At the latter place, it comes directly under the top drip moulding and prevents leaking of the rain over the glass. Near the top, on the sides, are grommet holes to allow the air pressure to escape.

The glass windshield is two pieces, both the upper and lower parts being made movable; thus ventilation is obtained, and the ventilators in the cowl or sides are not required. The windshield, with the lower part movable for enclosed cars, has been gaining greatly in the last two years, although formerly this was deemed not advisable on account of the leakage of rain around the sides and bottom of the lower part. The new shields, however, jump the fence in the same manner as the door windows; on the sides there are rubber strips, the advantage of having this lower glass operate in

this manner being more than offset by the chance of having a small amount of rain enter at this point occasionally. Also, the fashion of having the cloth trimming material come across the front just inside the windshield has been generally abandoned, so that there is only painted metal or wood parts at the place where rain may enter and permanent marks are not made as when cloth goods are soaked with water.

The other important feature that is new in this design is the change of the rear quarter window. Years ago this window was always rounded at the lower



The sedan planned by Mr. Mercer

rear corner; then came a change to the rectangular window, and this has continued so that practically all bodies use the latter form of window shape to-day. It is made as large from back to front as possible, its objectionable feature, however, being that it can only be lowered part way. The cut-in of the body at the wheelhouse for wheel clearance makes it impossible to lower the glass even, as with the doors unless seat room is sacrificed for this. The rear seat in that case will only accommodate two passengers.

The design shown is a combination window. There is a small drop window that will go down all the way, this being made possible because the belt line and lower sash line are high. There has been a marked tendency of late to carry the dividing line of the body higher. Formerly this line was determined by the drop length of the door window, the window being made as deep top to bottom as the space below would accommodate when lowered. The design shown has all windows drop level, though the rear door is cut to clear fenders. This line is indicated dotted and shows that the seat room sacrificed for the quarter window is negligible.

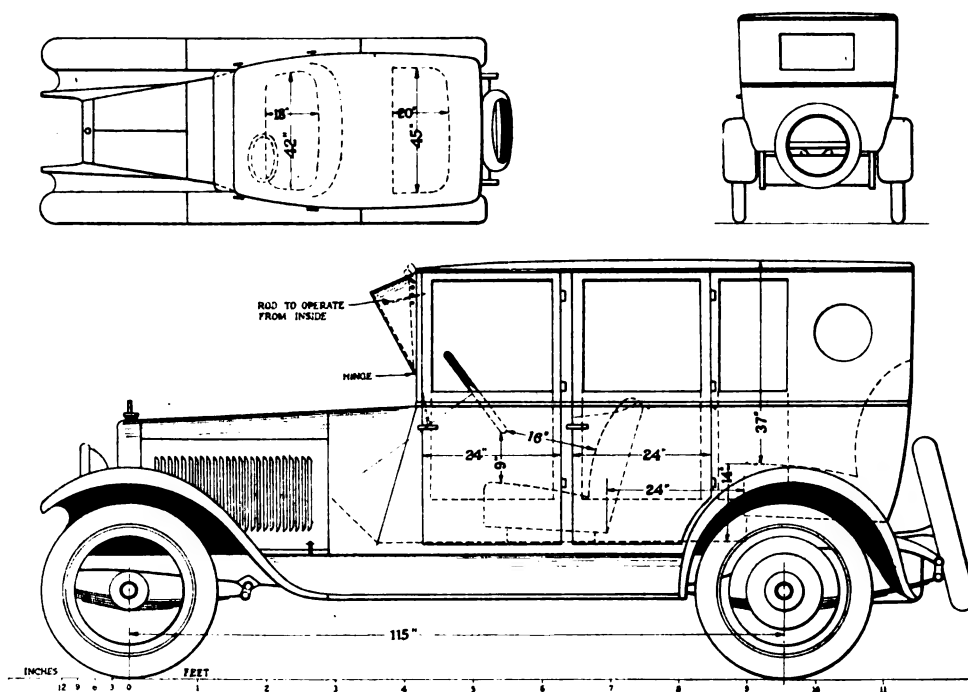
The depth of the quarter beyond the small drop window is relieved by a small round glass, that can also be made to drop if desired. At the rear the large back window is stationary.

The other new line on this body is the slant line forward of the front door on the lower panel, this line helping in making the width of the body a little greater at this place to allow room for the driver at the wheel. The line is formed in the panel and the cowl is simply shaded from the dash width up to it.

The design is conventional in size and general form to the standard type of enclosed body, except for the features enumerated. The doors are large with outside hinges and bar handles; the lines are straight and the roof flat. The rear of the front seat, which always extends unduly into the rear doorway on a short wheel-base chassis, in this case is made as rounded on the ends as possible so as to give the maximum entrance way to the rear seat.

As nearly all bodies are now made with steel panels, 20 gauge sheets can be shaped easily into the most intricate shapes, even by hand. On this design there are no exacting shapes. The horizontal mouldings at the center and the top serve to cover the joints and eliminate welding. The rear back, both upper and lower, is one piece up to the door joint. The framework of the doors and posts forward of this and above the belt moulding are finished in the wood and painted. There is no objection to having wood surfaces show, provided they are well painted. If this is not done, then metal must cover everything.

The room in this case is either laminated wood covered with canvas or commercial fiber. The different views show the design from various angles. On the top view, the rear corner is shown with a very small radius. For a body of this size, a rounded rear corner is preferable to square, but the radius should not be



Plan and sectional views of the proposed design

more than 3 or 4 in. The top, back and side views are drawn to scale and the chart will enable the determination of any dimension not enumerated. The two small views are one-half the size of the larger side view.

It is intended to use regulators on all windows. The quarter window being small, the regulator will come forward of the seat side and not cause inconvenience. More especially is this so now, as the trimmings of the rear sides are quite often plain, the arm rest being the only break in the plain side. The convenience of having regulators on the windows, aside from the ease of raising and lowering, is that they actually lock the windows and prevent any tampering with the inside when the doors are locked. Bodies must be locked to protect the interior parts when left standing. A body, as here illustrated, needs inside locks on three doors and, on the front right door, an outside lock. One objection to the use of the regulator on the front door is that the handle interferes with the driver. Some makes of regulators have a provision to put the handle off center. In this case the offset should be reversed of the doors. On the front, place it toward the front and on the rear toward the back. Also, the slant line on the body described before will allow the body to be made slightly wider at this point than ordinary, to get ample elbow room for the driver.

Crown fenders are shown on this design. They make up better than any other fender, as there is about them a stability and appearance of worth that makes them the most satisfactory for a high-class car. The same may truly be said of the small louvres in the engine hood.

To emphasize the true aspect of this design, the perspective view will serve more fully than the skeleton views. It shows the body in its natural position to the eye and does not leave something to be imagined, as in the case with plainer views.

Appointments of these bodies are less elaborate than formerly. There is a tendency to eliminate all that cannot be put on the instrument board, except the

(Continued on page 851)

Motorcycle Models Follow Automobile Practices

Features of the new Militor include pressed steel frame and cantilever springs. The instrument board is mounted between the handle bars. A four-cylinder unit power plant with automobile type transmission drives through shaft and bevel gear. The machine mounts artillery type wheels.

THE Militor motorcycle, which was first exhibited this season, was designed in co-operation with the Ordnance Department of the Army, for military use, and several machines were shipped to France shortly before the armistice. Probably, the most noticeable features of the machine are the pressed steel frame, cantilever rear springs, and artillery type wheels, all of which are clearly shown in the accompanying illustrations. Note also the unusual suspension of the front wheel and the strict adherence to the automobile type of transmission.

The engine is a 4-cylinder, 4-cycle, with overhead valves, having a total piston displacement of 68.72 in., its bore and stroke being $2\frac{1}{2}$ and $3\frac{1}{2}$ in. It is stated by the Militor officials that a maximum horsepower of 22.6 has been obtained. The crankshaft is a one-piece forging, following conventional automobile practice, is mounted on three main bearings each $1\frac{1}{2}$ in. in diameter and is dynamically balanced. Large valves are used, both being located in the cylinder heads, and the combustion chambers are tapered outward at the top to permit the use of valves larger than the ordinary. The inlet valve has a throat diameter of $1\frac{3}{16}$ in., while the exhaust valve has a throat diameter of $1\frac{5}{16}$ in. Spiral timing gears are used, the camshaft being carried in three bearings. Pressure feed oiling is used, and all machines are equipped with Militor Kingston carbureters, Splitdorf generators and Connecticut ignition.

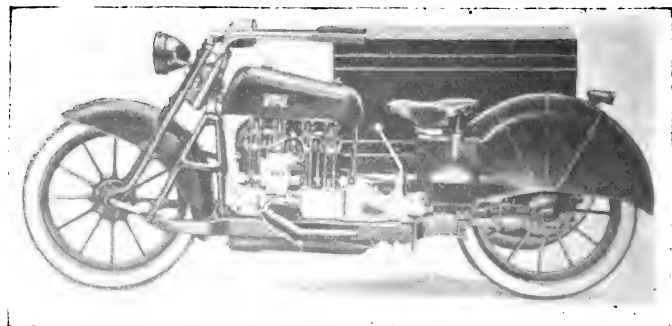
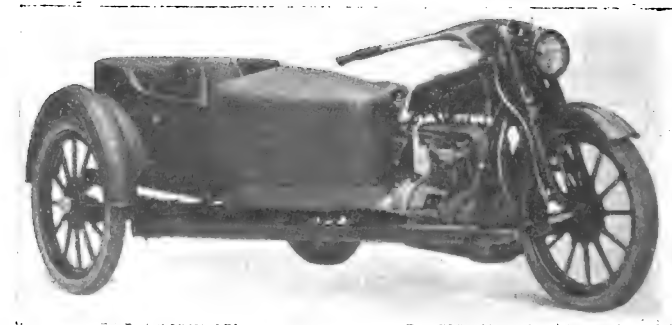
The pressed steel frame of the machine, previously referred to, is of one piece and forms the lower half of the crankcase and transmission housing, performing the functions of a frame. This design permits at the same time a low saddle position (26 in. from the ground), together with an unusually high road clearance, this clearance being 7 in. The wheelbase is 65 in. Runningboards are mounted directly on the frame and provide unusually liberal foot room.

A multiple disk asbestos faced clutch, 8 in. in diameter, is used in conjunction with selective 3-speed forward and reverse transmission, following automobile rather than motorcycle lines. The gear ratios are: High, 4.4 to 1; intermediate, 6.91 to 1; low, 12.28 to 1, and reverse, 16.68 to 1 for the sidecar model. The gear ratios for the Solo model are slightly different, being 4.0, 7.0 and 11.0 forward, and 11.5 reverse.

The starting mechanism consists of a foot pedal operating a gear sector which engages through the transmission and is designed to prevent "kicking back" in event of the engine backfiring. The small instrument board is mounted between the handlebars in a manner suggesting the automobile and carries speedometer, switches and horn. Control is by twisting the handlebar grips in the conventional motorcycle manner.

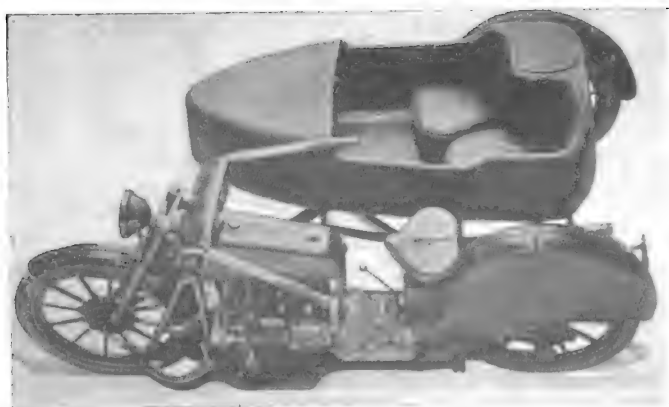
The front wheel suspension is a radical innovation. Two rows of ball bearings are carried on a hollow shell, which in turn carries two rollers. As the machine is steered, the wheel, by these rollers, moves around a tube formed into an arc pivoted to the front of the pressed steel frame.

The suspension of the rear wheel is by flat cantilever



Above—Three-quarter view of Militor motorcycle, showing the usual lines of sidecar

Below—Side view of Militor motorcycle, showing general arrangement. Note pressed steel frame, suspension and automobile type unit power plant

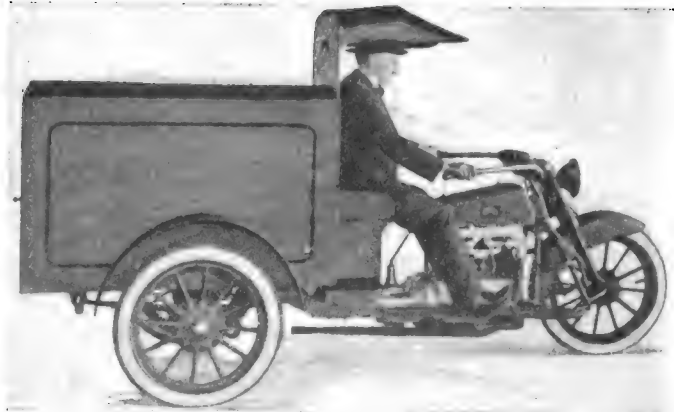
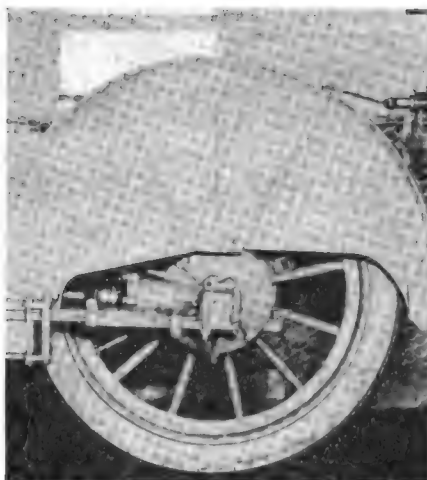


Top view of Militor motorcycle with two seat sidecar showing arrangement of seats

springs bolted directly to the frame and to the axle, the drive being by bevel gears totally enclosed. An external contracting band brake, 10 x 1½ in., is provided on this wheel. In general design, the brake strongly suggests automobile practice and is stated by the manufacturers to brake the machine at high speed with slight effort on the part of the rider. Departing again

from motorcycle practice, the rear wheel mudguard is extended until it houses almost the entire upper half of the wheel.

Both wheels are of the artillery type, and are equipped with 28 x 3 in. tires. The Solo machine complete, with empty tank, weighs 480 lb. It is listed at \$450 and the



Above—Militor delivery tri-car

To the left—Militor rear suspension and bevel gear drive direct to wheel

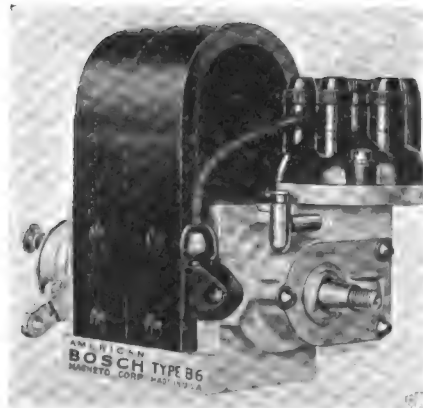
sidecar model, complete with two-passenger sidecar of Militor design, is listed at \$575. The Militor company also is preparing a tri-car delivery wagon with a carrying capacity of 750 lb., wheelbase of 82 in. and tread of 46 in. This tri-car is constructed by substituting a two-wheeled car for the rear end of the motorcycle model.

New Magneto Type Is Simple Construction

THE new Bosch magneto, known as the B Type, which was shown at the 1920 automobile, truck, tractor and motor boat shows, marks the first radical change in Bosch design for many years. These Type B magnetos are equivalent, both electrically and mechanically, to the previous types, but they are simpler in construction, and are a better quantity production proposition. Because of the saving made, particularly in the distributor, the new magneto is offered at a slightly lower price; we understand, however, that the high-class workmanship and material which have characterized Bosch magnetos are maintained.

The frame is cast of aluminum and includes not only the magneto base, but also the pole shoes and the shaft end plate. The armature and interrupter are of standard Bosch construction and the armature rotates on ball bearings, which are packed in grease, making it unnecessary to oil the instrument.

The distributor member is of new design and is furnished in both brush and jump-spark types, the jump-spark type being known as Ed. 1 and the brush type as Ed. 2. The distributor rotor is driven by two meshing gears, one mounted on the armature shaft and the other on the distributor rotor shaft. This design is said to insure absolutely noiseless operation. The high-tension current is led from the slip-ring collector brush to the distributor by means of a high-tension cable, which is fas-



tened to the central terminal upon the distributor block.

Type B magnetos are now being furnished with two styles of interrupter housing and timing arms, the first the standard Bosch housing and arm, the second the new style housing and timing arm, which consists of a cast arm and band encircling the housing. This hous-

ing is perfectly plain and carries no broaching, the band being held tightly in position by a screw which binds its ends together. This screw in turn fastens the ends to the cast arm.

This magneto is also made up in a special form for tractor work and is then known as the Type BT4, which is in all respects similar to the type B magneto, except that it is provided with the Bosch adjustable impulse coupling enclosed in a dust and waterproof case.

A New Sedan Body

(Continued from page 849)

dome and corner reading lamps. These are limited to one lamp in each corner and one dome light in the center. A flexible robe rail is put on the rear of the front seat and curtains on the quarter and rear doors and back light. Sometimes a vanity case is put on the left rear door and the cigar lighter on the instrument board. The floor heater is a necessity now and the foot rest, if used, can be two carpet pillows or hassocks. Dull metal of silver or gold is the favorite finish, for interior appointments, and, in all cases,

ornamentation of uniform design is used throughout.

Trimming material, at present, is largely soft velours of modest colors. This has not the wearing quality of cloth fabrics. These latter seem most desirable for an all duty car, such as the foregoing, and, for hard use, the facing of the front seat and back are of leather. The design of trimming is universally plain and simple, this being true of the colors for the exterior. Blues that approach a green tint are well appreciated, and black mouldings serve as a relief.

Analysis of German Trucks by the Motor Transport Corps

This article continues the report on the trucks surrendered to the A. E. F. under the terms of the armistice. The results of the investigations and tests are being made public as rapidly as they are completed on each truck.

By W. E. Noakes

The Audi

THE engine is four-cylinder, L-head, with intake in head, $3\frac{9}{16}$ x $5\frac{1}{2}$ in., four point suspension by upper half of crankcase.

Cylinders are cast in pairs, held down by seven $7/16$ in. studs. Cylinder walls, $\frac{3}{8}$ in. thick, chamfered and slotted at base for connecting rods to take care of $\frac{3}{8}$ -in. offset of crankshaft. Combustion chamber partially domed with offset to valve chambers, which are located on left-hand side. Single intake passage enters from right hand side at top of cylinder entering into two intake chambers, while on the exhaust individual ports with passages directly below the valve chambers are used. Water area fairly proportioned to size of cylinder; the water entering from the bottom of cylinder through cast-in pipe, circulating around valve chambers and cylinders, rises and is discharged through opening centering around intake passage on top of cylinder block. Exhaust valve guides are cast integral with cylinder. Two $\frac{3}{8}$ -in. drilled holes spaced $1\frac{1}{4}$ in. apart and offset are drilled from bottom of valve chamber to top of cylinder for valve stem, operating overhead intake valve. An enclosure is cast integral with cylinder walls for the protection of valves and springs. Spark plugs are located in counterbored pocket on top of combustion chamber, while priming cups are located on right hand side entering combustion chamber just above piston travel. Intake manifold, aluminum casting, two ports, ram's-horn type with governor butterfly valve, assembled in neck. Exhaust manifold is of cast iron, four-port type with passages tapering to the rear. Hot air attachment mounted between second and third openings.

Flywheel and Crankcase

Cast iron, machined all over, $16\frac{1}{2}$ in. in diameter, 5 in. wide, web $\frac{1}{2}$ in. thick, 5-in. recess for flywheel hub. Rim counterbored $2\frac{1}{2}$ in. for cone clutch. Rim 1 in. thick. Flywheel is counterbalanced by eight $\frac{3}{4}$ -in. holes partly drilled in web of rear rim.

Upper half of crankcase is of cast aluminum, compact, well constructed, heavily supported at crankshaft bearings, and has a cast-in oil lead with separate connections leading to oil pockets cast over bearings. A cast-in ram's-horn type water passage enters on left-hand side through flange, and passes around camshaft, center bearing boss with openings between first and second and third and fourth openings of upper side of crankcase. Cast-in oil trough is located under camshaft for lubricating cams in question. Combination breathers and inspection plates located on right-hand side. Extending from body of case

to supporting arms, full length of case on both sides, is an integrally cast trough, 4 in. deep, with cast-in oil reservoir located in the rear on left-hand side, having shut-off cock and passage to oil reservoir in lower crankcase. A 3-in. drain plug is located on underside of flange for this oil reservoir. Lower crankcase is of cast aluminum, light and well constructed, having an oil reservoir separated by steel screening and tapering from front to rear of case. A cast-in chamber holds the oil pump with connections to a cast-in oil lead, which extends across rear of case with opening for cast-in oil of upper case. An oil-sight feed, consisting of wired celluloid plate and bracket, is mounted on side of flanged opening of oil pump chamber, and protected by spring steel cover. Gear case cover is of cast aluminum and light, with an extended boss for starting crankshaft.

Crankshaft and Bearings

Semi-finished steel forging, short cheeks $15/16$ x $2\frac{3}{16}$ in.; long cheeks, $1\frac{3}{8}$ x $2\frac{3}{16}$ in., chamfered on each end. An oil ring, having one side machined for bearing thrust, flywheel hub and clutch shaft is forged integral with crankshaft. Connecting rod pins are drilled for oil holes with ends opening in sheet metal oil collectors spotted on short cheeks.

Bearings are babbitt lined, bronze backed; upper half carried in case drilled for oil hole and connected to X-shaped oil groove. Lower half is carried in steel forged cap, $1\frac{1}{4}$ in. wide and held down by four $\frac{1}{2}$ -in. studs in single row; two inside studs extending 3 in. above machined surface of case. This half of bearing has X-shaped oil groove, and is doweled in cap. No shims used as joints are lapped. Front and center bearings are $1\frac{9}{16}$ in. in diameter and $2\frac{3}{8}$ in. long, while rear bearing is $1\frac{9}{16}$ in. in diameter and 3 in. long. Thrust of crankshaft divided between front and rear bearings.

Connecting Rods and Bearings

Drop forged, I-beam type, semifinished. Small end has threaded boss with saw slot through to bearing. Clamp nut fits on threaded boss, clamping bushing, and is locked by cotter pin or wire that is passed through nut and saw slot. Small end has two countersunk oil holes, each spaced 30 deg. from top. Upper half of big end has four countersunk oil holes, two on each side of connecting rod bolt boss. Cap is held in place by two $7/16$ in. bolts.

Small end bearing is an eccentric bronze sleeve, grooved on outside as well as on the inside connecting to three oil

holes in bushing. Big end bearings are babbit lined, bronze backed. Upper half has X-shaped oil grooves with leads connecting to oil holes in rod, while lower half has X-shaped oil groove and no oil holes or scuppers. No shims used as joints are lapped. Bearings are $1\frac{5}{8}$ in. in diameter x $2\frac{3}{8}$ in. long.

Piston and Pins and Timing Gears

Cast iron, flat head, $4\frac{1}{4}$ in. long with four $\frac{1}{4}$ -in. hammered, lapped and concentric compression rings, and one $\frac{1}{4}$ -in. miter joint ring used as piston pin lock. Piston head is very thick, no support, while skirt is $\frac{1}{8}$ in. thick, having $\frac{3}{8}$ x $3/16$ -in. rib at bottom. No oil holes or oil rings used—skirt has slight chamfer at bottom and ground.

Piston pin is of steel tubing, hardened and ground, $15/16$ in. in diameter, having two slots, one on each end for locking on piston. Piston pin is located $1\frac{7}{8}$ in. from top of piston.

The timing gears are of spur type, steel forgings, machined, not hardened. Crankshaft gear is pressed on crankshaft and held in place by key and starting crank jaw. It is $3\frac{1}{16}$ in. in diameter, has 24 teeth, $\frac{1}{4}$ in. deep, $\frac{1}{4}$ in. at base of tooth and $11/16$ in. face. Hub is drilled and tapped for gear pullers. Idler gear bolted directly above crankshaft gear is mounted on concentric flanged stud, adjusted two ways by set screw on top of case and a turn screw inside of case. Gear is held by $\frac{1}{4}$ -in. washer pinned to stud. Camshaft gear keyed and locked by castellated nut to camshaft, while the magneto gear is pressed and keyed on an extended shaft with the extension used for fan pulley.

Camshaft and Bearings

Drop forged, machined, $15/16$ in. in diameter, with cams forged integral hardened and ground. Cam radius $1\frac{1}{2}$ in. in diameter, width $\frac{1}{2}$ in., lift $5/16$ in. Spiral gear on rear end drives governor, which has an extended shaft below for driving the oil pump. Shaft is mounted on three bronze bearings, front and rear sleeve type with bolting flanges, while center is a split bronze with oil holes and oil grooves.

Valves and Valve Tappets and Guides

Mushroom type, flat head, intake valve head 2 in., exhaust valve $1\frac{3}{8}$ in. in diameter, chamfer 45 deg., width of seat $5/32$ in., thickness of head $\frac{1}{4}$ in., length of stem intake $3\frac{3}{8}$ in., exhaust $7\frac{1}{4}$ in., diameter of stem $\frac{3}{8}$ in. Valve springs are held in place by sheet steel retainers with elongated slots, fitting over flat sides of valve stems and locked by hex nuts on threaded portion of valve stem. The intake valve is assembled in a cast iron chamber fitting in a machined recess of valve chamber in top of cylinder directly over the exhaust valve. The rocker arm operating the valve is assembled in cone-shaped housing, held down on one side by stud and nut and a brass sleeve with one end screwed into cylinder and large hex nut on top. The valve stem rod is $12\frac{3}{4}$ in. long, $\frac{3}{8}$ in. in diameter, made of steel tubing, having hardened steel plug on upper end. Lower end has threaded screw with hardened joint and a retainer for a secondary valve spring. The outer arm of rocker that rides on valve stem rod protrudes beyond housing and is not protected. Lubrication of this valve is through oil hole in top of housing. Intake valve assembly is held in place by machined steel cap $2\frac{1}{2}$ in. in diameter, with hex. head on top. Valve and valve springs are protected by an aluminum cover, having two slots that fit over dowels on crankcase. This cover is held by a spring clip bolted to cylinder block, which is easy to remove and replace.

Valve tappets are roller type with rollers mounted in hollow steel stem $2\frac{1}{2}$ in. long and $\frac{7}{8}$ in. in diameter with the conventional type jam nut and adjusting screw in head of stem. Valve stem guide is of cast-iron slotted at bottom for roller, preventing stem from turning in guide. Length, $2\frac{1}{2}$ in., slightly chamfered inside on top end and having bolting flange and boss for one hold-down stud. The intake valve tappet guides are set at a slight angle to meet the offset valve stem rod in cylinder block.

Governor and Oiling System

Flyball type, mounted on a vertical shaft driven by spiral gear on rear end of camshaft. Flyballs are bolted to sheet steel flange with steel hub and covered by a removable sheet steel cap. The steel hub on which flyballs are bolted is slotted for yoke so that when governor is in operation the sleeve moves up or down, thereby controlling the butterfly valve in neck of intake manifold, which is connected to governor by rod and yoke mounted across the rear end of upper crankcase.

Oiling system is force feed through spur gear. Oil pump mounted on left-hand side of lower case and driven by vertical shaft connected to governor assembly. The oil is drawn from the oil reservoir through screen and pump and forced through cast-in oil leads from lower half of crankcase in cast-in oil lead in upper half of crankcase with leads to cast-in oil pocket above main crankshaft bearings, and front end gear cover for timing gears. Rest of engine is by oil vapor. A reserve oil chamber with shut-off cock in passage between reservoir and main reservoir in lower crankcase contains approximately 1 gal. of oil. An oil sight feed gage is located on lower half of crankcase for finding level of oil.

Water System, Ignition and Carbureter

Thermo-syphon water entering cylinder through crankcase.

Ignition is a single system, high-tension type, ZU-4 Bosch magneto. Magneto is anti-clockwise with the customary practice by advancing the breaker box. For checking up the position of the secondary rotor, there is a small celluloid window placed opposite contact number one in the secondary distributor cover. Magneto is located on the left-hand side of motor, and is driven by a flexible coupling connected to shaft, which is driven by timing gear in front end case.

Carbureter is a $1\frac{1}{2}$ -in. vertical Zenith, construction of which is identical with the American Zenith. Throat of venturi is 23 mm. Body of carbureter is of cast bronze with an attachment for hot air.

Fan

Fan, 16 in. in diameter, 3 blades, cast aluminum, cast integral with fan; hub having a machined fan pulley on rear. Fan shaft is an eccentric shaft, front end mounted on ball bearings in hub, and rear end screwed into an adjustable flange that bolts on side of cylinder block.

Weights and Remarks

Piston, 2 lb. 13 ounces.
Connecting rod, 4 lb. 9 ounces.
Valve tappet, 13 ounces.
Exhaust valve, 8 ounces.
Intake valve, 6 ounces.
Valve spring (exhaust), 5 ounces; intake, 3 ounces.

Engine is well designed, compact and favorable for production and service. All reciprocating parts easily accessible for adjustments, either through inspection plates or dropping lower case. All parts and castings show good workmanship and well proportioned. In general, engine follows American practice.

The Application of Engineering in Building Tractors

This article might be called "Getting down to brass tacks in tractor manufacture." It sets forth present development, in brief, and traces certain tendencies that have crept into construction. But above all, it shows the engineer some of the problems that demand solution.

By E. F. Norelius*

THE tractor industry as a whole has passed its decade mark and we find quite a number of firms to-day which were well established in the business even considerably more than ten years ago. Still there are many who assert that the industry is still in its infancy and, after observing the great variety of machines that are being built and the great many types that are being designed, this statement cannot be denied.

Except in the case of hauling propositions, the tractor has to pull loads of the most varied nature and requires drawbar capacities varying from 500 lb. to perhaps as high as 15,000 to 20,000 lb. In fact, the drawbar capacity is determined by the market conditions, that is, the demand for any particular size. It is plain, therefore, why the tractor industry has been slower in getting down to a stable basis and to a standardized product than its forerunner, the automobile industry.

Design Not Fixed

It is realized by all tractor engineers that the tractor is still far from a settled design and that much remains to be done. That the industry has come to stay, no one will deny but to where it will lead us no one will venture to say. All engineers and men close to the industry are prophesying and, on the basis of their prophecy, are developing machines for the future trade but whether they shall realize on that prophecy is a matter of conjecture. There is only one safe course to pursue at present and that is to determine as nearly as possible the immediate needs of the trade, to make the necessary decisions regarding size and type, to act quickly and positively on a fixed policy, and to get the product on the market so as to realize on the investment as soon as possible.

No doubt there is a certain amount of business to be found with all sizes within the limits given above. In the early years of the industry all effort was centered on the larger sizes. This was due to two reasons. First, there was an apparent need for some large powerplant to break the virgin prairie of the western plains and this appeared to be the big demand of the times. Second, there were the large steam engines, built primarily for threshing purposes, but also used to some extent as tractors to pull plows. They were not designed for this latter purpose, and their gears and other parts were too light. On the West Coast, however, there had been for years a demand for a road tractor for use in inaccessible regions where there were no railroads and where hauling by mules or horses was next to impossible.

In the meantime, the automotive industry had attained a state of high production by means of specially built

machine tools, progressive assembly and other labor-saving devices. About the year 1914, there arose a demand for tractors built by similar methods. The trend of the market also had gradually shifted from the large tractor to the smaller unit, a unit for which there would be a broader demand. These, then, were the two reasons for the change: First, the change in the demands of the trade and, second, the demand for high production at low cost, permitting a lower selling price and a wider market. With few exceptions the trend was toward the four-cylinder vertical engine in place of the one and two-cylinder types used on the earlier machines.

The new ideas of manufacture developed in the automobile industry also called for a different type of construction, one that would lend itself readily to the progressive system of manufacture. No doubt the Ford interests were the leaders of this development, for as early as 1913 they were working on the development of a small tractor for high speed production. The whole industry was anxious to see this new tractor in the field and to study its operation.

The foregoing short discussion has been written only to recall what a wild scramble tractor development has been. It is not the purpose of this paper to give any historical survey of the tractor industry, but to attempt to crystallize thought to a more analytical study of the problems to be met. As thought was shifting from the large to the small unit, there was a great deal of discussion as to the proper size of tractor. These discussions were held within factory walls and appeared in lengthy articles in technical papers. Ideas varied from the two-plow tractor to as high as the six-plow. It appears from all these analyses that the four-plow is the most efficient type, but still, from statistics it is found that the two- and three-plow are built in much the larger numbers. This may be due to manufacturing facilities and the greater adaptability of the smaller unit to progressive manufacture but it may also be due to the wider range of use to which it may be applied.

Range of Work for the Tractor

The foregoing covers some of the general thoughts which have come up in the past in the development of tractors and which have been so often the basis of design. However, the industry is beginning to realize the need of a more thorough analysis of the purposes of the tractor.

The work to be done by a tractor is of such a broad nature that it is next to impossible to cover it fully by any outline. The chief operations may be enumerated as follows:

1. Plowing—This in the past has been considered the main item but of late years opinion has come to

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recognize that the whole field must be considered. There are a great many conditions and types of soil to be met in this operation.

2. Harrowing—This is of two general types, by means of tooth harrows and disk harrows, respectively.
3. Seeding.
4. Harvesting.
5. Corn planting.
6. Corn cultivating.
7. Mowing.
8. Threshing—There are two methods in use. In the Middle West and the East, use is made of stationary threshers and separators, and in the West, of combined harvesters and threshers.
9. Shredding or running ensilage cutters.
10. Hauling—This includes hauling on the road and in the field; hauling field products to the market, supplies in road building, ore and the like.
11. Road grading.
12. Industrial Work—Hauling around industrial plants and freight yards.

To attempt to design a tractor that will answer the requirements of all of these variable operations and conditions looks like a stupendous task and it must be admitted that it is nearly impossible but that is the ideal to be aimed at and an effort is being made by some manufacturers to meet that ideal. It is no dream to say that it will be met some day and, in trying to meet it, it may be necessary to change some of the operations to meet the needs of design.

No Universal Tractor

There is no tractor to-day suitable for plowing that is suitable for corn cultivation. There is no tractor to-day that is suitable for hauling the product of the farm to the market, for the suspension is not correct for this class of work. Also, to make it suitable for all of the classes of work mentioned, it must be possible to operate the tractor from the implement, and the manufacturers who have given thought to this feature are indeed few. In the accomplishment of this, the tractor, no doubt, will have to be built so that certain attachments may be used with it, in making it suitable for certain classes of work. The small farmer cannot afford to invest in several different types of automotive equipment and, therefore, thought must be concentrated on that type of equipment that has the widest range of use and is the most efficient over that range.

In order to give the problem that analytical thought which it requires, it is necessary that each farming operation be thoroughly analyzed in its various phases and conditions to determine the power required for that operation and the proper speeds at which to operate. The tractor should also be analyzed to determine relations between drawbar pull and weight or coefficient of adhesion of driving wheels. Of course, ground conditions are variable throughout the country but there is some constant for this figure that is the best average for all conditions. The large percentage of the tractors manufactured to-day were designed by starting with a certain size motor and designing around this as a foundation, leaving the problem as to the purpose of the tractor to the last or perhaps to the tractor salesman.

Torque and Power Formulae

This will be made clearer by the following simple technical analysis of certain fundamental relations between stresses, torque and other factors.

Let f represent the coefficient of adhesion of the driving wheels.

e_1, e_2, e_3 , etc.—Gear train efficiencies from final driving gears to engine.

R —Rolling resistance of tractor, in per cent.

w —Weight of tractor on driving wheels, in pounds pulling rated load.

P —Drawbar pull (pounds).

D.H.P.—Drawbar horsepower.

s —Speed in miles per hour.

D —Diameter in inches of driving wheel (or driving sprocket in case of track-laying types).

w_1 —Weight on idle ground wheels when pulling rated load in case of tractors with front steering wheels or other arrangements.

P_1 —Pull on wheel rim.

r_1, r_2, r_3 , etc.—Gear ratios for each gear reduction (drive wheel to engine).

Then:

$$P_1 = fw \quad (1)$$

$$P = fw - (Rw + Rw_1) = w(f - R) - Rw_1 \quad (2)$$

In case of tractors in which all wheels act as drivers Rw_1 would disappear.

$$\text{Torque at driving wheel} = \frac{fwD}{2} \quad (3)$$

$$\text{Torque on first countershaft} = \frac{fwDr_1}{2e_1} \quad (4)$$

$$\text{Torque on second countershaft} = \frac{fwDr_1r_2}{2e_1e_2} \quad (5)$$

$$\text{Torque on third countershaft} = \frac{fwDr_1r_2r_3}{2e_1e_2e_3} \quad (6)$$

$$\text{Torque at motor} = \frac{fwDT}{2e_1e_2e_3 \dots e_n} \quad (7)$$

Where n is the total number of reductions and $T = r_1 \times r_2 \times r_3 \times r_4 \dots r_n$

$$\text{Drawbar horsepower} = \frac{88Ps}{33000} = 0.00266Ps \quad (8)$$

Brake horsepower of engine =

$$\frac{88P_1s}{33000 e_1e_2 \dots e_n} = \frac{0.00266P_1s}{e_1e_2 \dots e_n} \quad (9)$$

After a thorough study of the problem, certain of these functions and their relation may be assumed. Surely, there is one assumption that is the best for a certain type of tractor and most nearly answers all conditions of work and soil. For the sake of illustration, the following assumptions will be made:

Taking a standard four-wheel tractor with the drive on the rear wheels, we will assume that 10 per cent of the weight of the tractor is on the front wheels when the tractor is exerting its rated or normal drawbar pull.

We will also assume that:

$$f = 0.50$$

$$R = 0.05$$

$$D = 60 \text{ in.}$$

That there are three gear reductions with an efficiency of 0.96 per cent each.

That the normal speed $s = 2.5$ m.p.h. and that a "normal speed" or rated drawbar pull of 2400 lb. is desired.

Then $w = 9w_1$

$$2400 = w(0.50 - 0.05) - .05w_1$$

$$w = 5400 \text{ lb.}$$

$$w_1 = 600 \text{ lb.}$$

Or total weight of tractor is 6000 lb.

$$P_1 = fw = 0.50 \times 5400 = 2700 \text{ lb.}$$

Torque at driving wheel =

$$\frac{fwD}{2} = \frac{0.50 \times 5400 \times 60}{2} = 81,000 \text{ lb.-in.}$$

Drawbar horsepower = $0.00266 \text{ Ps} = 0.00266 \times 2400 \times 2.5 = 16.0$

Brake horsepower of engine =

$$\frac{0.00266 \text{ Ps}}{e_1 e_2} = \frac{0.00266 \times 2700 \times 2.5}{0.96 \times 0.96 \times 0.96} = 20.3$$

Some Assumptions Must Be Made

After determining the r.p.m. of the engine and the gear reduction for each of the reduction sets, the stresses throughout the tractor can be worked out from the above computations. These are, indeed, simple and elementary studies but, nevertheless, are the fundamentals of the problem and some such standardized analysis should be used in every engineering department working on the design of tractors, for then it will become much easier to study the operation of the tractor and to analyze its efficiency.

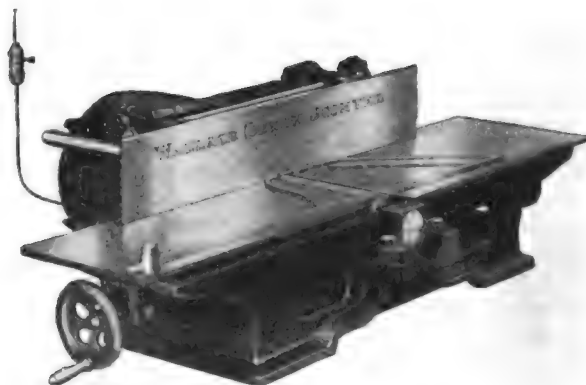
The difference between different types of tractors may also be analyzed and a comparison made of tractors with driving and idle wheels and tractors with no idle ground wheels.

In this connection, the question naturally arises regarding the application of the above formula in case of tractors with several speeds. All of the assumptions made in the above study must be safe operative assumptions; that is, a tractor designed in accordance with them must be able to go into an average field (a wheat stubble field, for instance) and develop the horsepower and drawbar pull given. Also, the rated horsepower of the engine should be a certain percentage of the maximum brake horsepower—80 per cent is the figure usually used. The strength of the parts for this tractor should be designed for the normal working speed of $2\frac{1}{2}$ m.p.h., taking the example given. Higher speeds can now be put in without danger of overloading any of the parts but no lower gear with any material reduction in speed should be put in, for this will increase torques and call for an increase in material. In this manner, the lightest and most efficient tractor for a given drawbar pull may be designed.

Portable Bench Type Jointer

A NEW model of the 6-in. bench type jointer has been developed that is of special interest to the pattern shop and other woodworking departments. The machine operates on an electric lighting circuit and is portable, the idea being to take it to the work instead of the work to the machine. This idea, when properly carried out, releases the heavy stationary jointers for major operations.

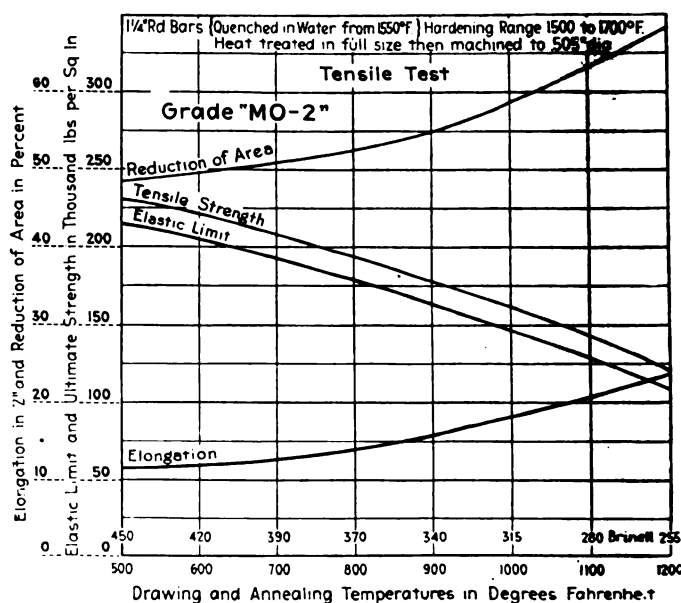
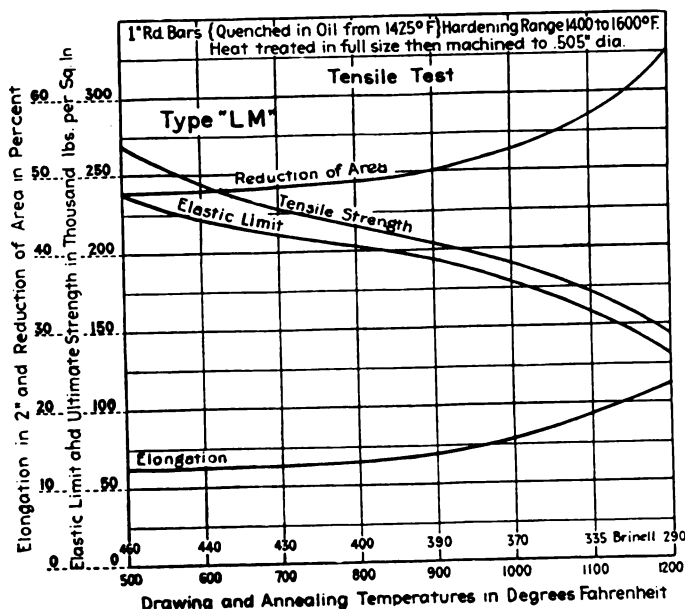
An adjustable fence provides for cutting at any angle up to 45 deg., and slides back and forth on rods attached to the motor, making possible the use of every part of the knife. A rabbeting edge is arranged conveniently for groove cutting. Ball bearings are used on the motor and cutter heads. It is claimed that work usually done by hand can be handled satisfactorily on this machine, and with a considerable saving of time. The manufacturers are J. D. Wallace & Co.



Side view of Wallace bench jointer

Physical Properties of Heat-Treated Molybdenum Steels

(See AUTOMOTIVE INDUSTRIES of Jan. 29, 1920)



Farm Lighting Plant Is Air and Water Cooled

THE new air and water-cooled farm lighting and power plant produced by the S. W. Merritt Co. comprises a compact gasoline engine, directly connected to a four-pole electric generator, the armature of which serves as a flywheel when the engine supplies mechanical power from the pulley at the end of the armature shaft. The plant is of the semi-automatic control type to the extent that starting is not automatic, but the engine is stopped as soon as the batteries have been fully charged.

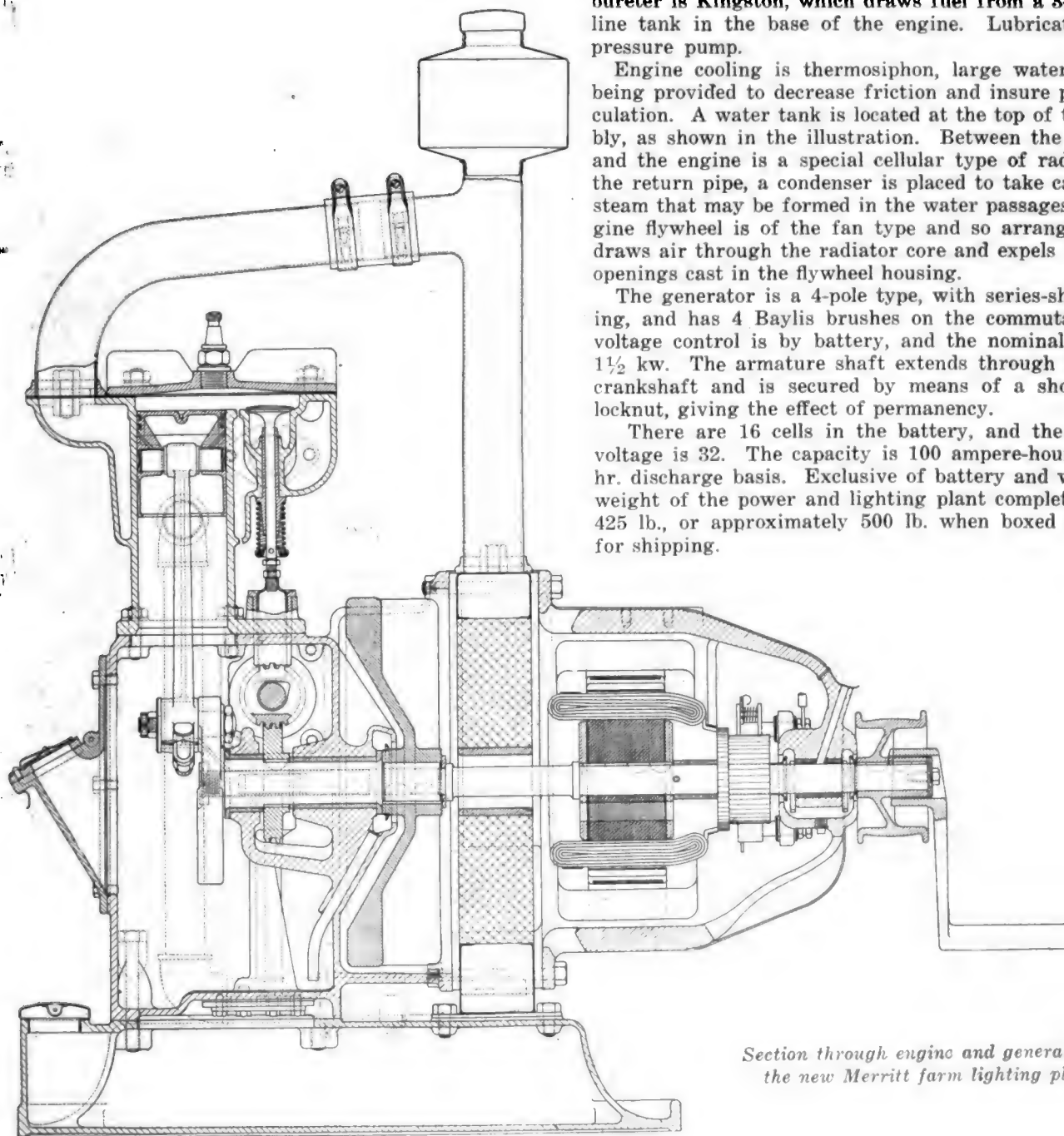
The manufacturers call attention to the fact that the non-automatic start has an advantage in compelling the operator to give the machine periodic attention.

The engine is a single cylinder 3 x 4 in. type, with poppet valves having a $\frac{3}{16}$ in. lift. Crankpin bearings are $1\frac{1}{4}$ in. in diameter x $1\frac{3}{8}$ in. long. The two crankshaft bearings are of plain design. Ignition is from a 6-volt tap from the battery. The plant is equipped with a K-W ignition coil and an A. C. or Bethlehem spark plug. Engine speed is controlled automatically by a centrifugal type of governor, giving a normal rate of 1350 r.p.m. The carburetor is Kingston, which draws fuel from a 3-gal. gasoline tank in the base of the engine. Lubrication is by pressure pump.

Engine cooling is thermosiphon, large water passages being provided to decrease friction and insure proper circulation. A water tank is located at the top of the assembly, as shown in the illustration. Between the generator and the engine is a special cellular type of radiator. In the return pipe, a condenser is placed to take care of any steam that may be formed in the water passages. The engine flywheel is of the fan type and so arranged that it draws air through the radiator core and expels it through openings cast in the flywheel housing.

The generator is a 4-pole type, with series-shunt winding, and has 4 Baylis brushes on the commutator. The voltage control is by battery, and the nominal output is $1\frac{1}{2}$ kw. The armature shaft extends through the hollow crankshaft and is secured by means of a shoulder and locknut, giving the effect of permanency.

There are 16 cells in the battery, and the operating voltage is 32. The capacity is 100 ampere-hours on a 10 hr. discharge basis. Exclusive of battery and wiring, the weight of the power and lighting plant complete is about 425 lb., or approximately 500 lb. when boxed and ready for shipping.



Section through engine and generator of the new Merritt farm lighting plant

Standardization of the Limit System in Machine Construction

A review has been made by Mr. Heldt of such work in this and foreign countries and he tells here the results of his investigations, showing particularly the application that may be made in all shop practice. Much difference has grown up and some system should be universally adopted.

By P. M. Heldt

ACCORDING to good authorities, the system of interchangeable manufacturing, wherein each machined dimension is held to definite minimum and maximum limits, was first used in the manufacture of arms. This interchangeable system received a great impetus during the late war, when a large proportion of all mechanical manufacturing concerns undertook Government work to which the system was applied.

Closely allied with the subject of interchangeable manufacturing is that of standardization of parts. The importance of standards in engineering practice was also driven home by the war, and as a result standardization movements are now under way in all industrial countries. This has brought to the fore one of the fundamental questions of standardization, that of cylindrical fits, which has long been under discussion in limited circles.

In interchangeable manufacturing, when a shaft or plug has to fit a hole, the degree of fit may vary from a shrink or press fit to a free running fit. There is, of course, a continuous variation between these two limits, but for convenience seven or eight different classes of fit are generally worked with.

For some of the fits the male part must be smaller in diameter than the female, for others larger. It is therefore obvious that, for fits of the same nominal size, one of the parts to the fit at least must vary in diameter according to the class of fit desired. The question is, which shall it be, the hole or the plug? Shall we use a basic hole or a basic plug? There are evidently advantages on each side, and a canvass recently made among British manufacturers as to which they preferred resulted practically in a tie.

Shaft Basis Vs. Hole Basis

If the basic plug system were adopted it would mean that the limiting diameters of all plugs or shafts of any given nominal size would be made the same, irrespective of the class of fit desired, and that the allowances for the different fits would be made in the holes. The hole would be made larger, for instance, for a running fit than for a tight fit. With the basic hole system the practice would be the reverse.

After the question of basic hole vs. basic plug sizes has been settled there comes that of how to apportion the tolerances. The parts cannot commercially be made to exact measure, but must be held within certain limits which differ from the nominal dimensions by what are known as tolerances. The tolerances may be either entirely positive or plus, entirely negative or minus, or partly positive and partly negative. The question as to which of these practices is the best is largely of an academic character,

but there are confirmed partisans of each, and if the standardization organizations were bent on pleasing everybody they would never get anywhere.

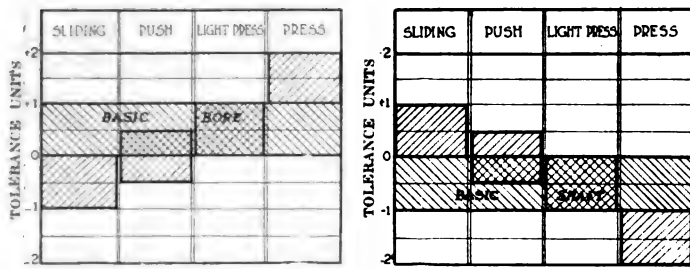
Even after the subject of sign of tolerances has been settled there remains a cause for possible variation. Whether or not a part is within its dimensional limits is determined by means of limit gages. These limit gages are checked for accuracy and the result of the checking operation depends upon the temperature at which it is performed. The French artillery arsenals, for instance, check their gages at 32 deg. Fahr.; American manufacturers at 60 deg. Fahr., and German manufacturers at 68 deg. Fahr. Before we can have absolute interchangeability of parts the gage-checking temperature must also be standardized.

Gage Calibration Temperatures

Reference standards are calibrated at 0 deg. C., or 32 deg. Fahr., on account of the simplicity and the logic of the plan, but in order to avoid misunderstandings, when measurements are made in the shop at normal atmospheric temperatures of about 68 deg. Fahr., it is necessary that the coefficients of expansion of the measuring instruments be equal. For this reason a subcommittee of the French Permanent Standardization Committee recommends that all reference standards be made of steel with a coefficient of expansion of 11 microns per deg. C. Machine shops may make use of measuring apparatus (shop standards) which may be made of ordinary steels. In that case, however, in order to make the measurements comparable, it is specified that the comparison with the reference standard be made at a temperature of 68 deg. Fahr. Thus the calibration of measuring instruments is definitely specified as regards temperature. The fundamental question in matters pertaining to cylindrical fits is that of the basic hole vs. the basic shaft system and on this question the French Commission assumes no definite attitude. The report, however, contains a table of tolerances for different fits, which is alluded to as remarkably simple and complete, says *La Technique Moderne*.

In this system, the hole, for any given nominal dimension, remains the same, irrespective of the character of fit desired, whether a running, sliding or press fit, variation of the clearance or overlap depending solely upon the variation of the diameter of the shaft or male part.

Those in favor of the basic hole system allege that the chief advantage of this system results from the fact that it calls for only a single series of reamers for all bores of a given nominal diameter, while the finishing operation on the shaft or male part may be readily performed in the lathe or grinding machine.



Figs. 1 and 2—German standards for tolerances and allowances for high-precision fits in the basic bore and basic shaft systems respectively

In France, the basic hole system is widely used. In England, the British Engineering Standards Association, at its meeting in May, 1919, expressed itself in favor of the use of this system. In Germany, a referendum was taken among manufacturers and 60 per cent of the returns received expressed themselves in favor of the basic hole system. The German Standardization Commission, however, lacked the courage to take a definite position in the matter and its standardization project includes both series of standard holes and of standard shafts.

Basic Shaft System

In this system of fits, the diameter of all shafts of given nominal size is the same, whatever the class of fit desired, the variation in allowance obtained depending solely upon variation in diameter of the bore or female part. A stock shaft may thus be used for various classes of fits. It is for this reason that this system is often employed when cold rolled steel shafting is used in repair work for instance. In some industrial countries, the basic shaft system has very strong supporters who, however, appear to be in the minority as a general thing. The Hanover section of the German Society of Engineers, at its meeting of Jan. 15, 1919, at which there were represented manufacturers of locomotives, freight cars, motors, steam engines, pumps, etc., adopted a resolution to the effect that the basic shaft system alone should be adopted as standard.

One of the arguments in support of the basic shaft system is that when it comes to reaming different materials, it is necessary to make use of several series of reamers, having not only different forms of flutes, but also different diameters, because it is a mistake to believe that the same reamer can be used in different materials and still leave the work within the specified tolerances.

Reamer Requirements Illustrated

This point is illustrated by an example cited in the German publication *Der Betrieb* by M. Schreiber Mayer, who takes the case of a shop having to make cylindrical fits of a nominal diameter of 60 millimeters in cast iron, steel and bronze respectively. These fits are of three kinds, press, sliding, and running; the former two must be of high precision, while the latter can be of moderate precision. This shop, in carrying on its regular work, using the basic hole system, will make use of the following reamers:

High precision fits—for cast iron.....	6
High precision fits—for steel.....	4
High precision fits—for bronze.....	4
Moderate precision fit for cast iron.....	6
Moderate precision fit for bronze.....	4
Total	24

For doing the same work with the basic shaft system, this same shop would need the following reamers:

Press fit, for cast iron.....	6
Press fit, for steel.....	4
Sliding fit, for cast iron.....	4
Sliding fit, for bronze.....	4
Running fit, for cast iron.....	6
Running fit, for bronze.....	4
Total	28

While making three different fits with the basic shaft system, the shop does not need three times as many reamers as required with the basic hole system; it needs only 28 reamers instead of 24. In making a calculation of manufacturing costs in the two cases, substantially equivalent figures are arrived at.

One advantage cited in favor of the basic shaft system is that a worn reamer, after regrinding, may be used for reaming a hole intended for a fit of the same nominal diameter but next in order in the series of fits, while a worn reamer with the basic hole system must be reground in such a manner that it can be used for a smaller nominal diameter, and for that reason is rendered useless much more quickly.

With the basic shaft system new reamers need be made only for holes corresponding to a running fit. After wear has set in, these reamers may be reground to serve for a sliding fit and finally for a press fit of the same nominal diameter. Therefore, with one and the same reamer three times as many holes may be reamed with the basic shaft system as with the basic hole system, and this involves a material economy; however, the number of shops which are capable of regrinding the reamers is very small.

Use of Cold Rolled Shafting a Factor

As a final argument in favor of the basic shaft system, its partisans point out that considerations of economy demand the use of shafts of cold rolled steel, wherever possible, and, consequently the use of the basic shaft system. It is a mistake to think that cold rolled shafting is used only for shop transmissions; it is frequently made use of in agricultural machinery, and some German firms, for instance, although accustomed to working according to the basic hole system, made use of the basic shaft system in the manufacture of submarine and certain other engines, according to *Der Betrieb*.

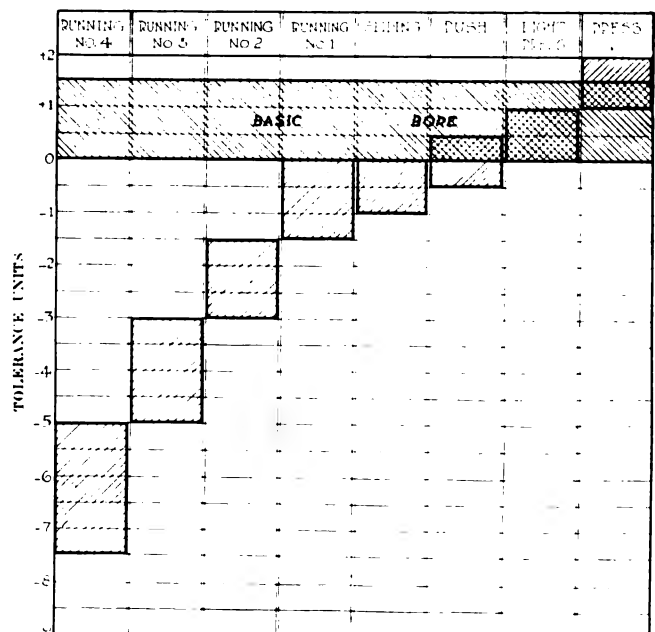


Fig. 3—German standards for tolerances and allowances for fits of moderate precision, under the basic bore system

In this system the tolerances are distributed on both sides of the nominal dimension. In other words, the shaft diameter and the bore diameter both vary in accordance with the class of fit desired. There do not appear to be many partisans of this system, except perhaps in the screw and bolt industry. For instance, in the rules drawn up by the International Congress of Zurich in 1898, there occurs the following:

"Clearance between Male and Female Screws.—Male screws and female screws or nuts corresponding thereto have theoretically the same thread, but in order to take account of the tolerances of manufacture, which are indispensable in practical work, which tolerances must vary according to circumstances, the fixed profile is a limiting profile, for the male as well as the female screw; this is an upper limit for the male screw, and a lower limit for the female. In other words, the male screw must always be smaller than the limiting profile, and the female screw must always be larger than the limiting profile."

Germans Have Standardized Both Systems

At the present time, certain manufacturers are protesting against this rule. On this particular subject the French Permanent Standardization Commission takes a definite standpoint, the following remarks appearing in its report:

"In present practice, frequent use is made in connection with screw threads of the expressions 'free fit,' 'slick fit,' 'tight fit,' which expressions are self-explanatory. These different fits may be obtained either by varying the screw or by varying the nut. It is our firm opinion that the dimensions of the nut should be fixed, and should correspond to the nominal dimensions. The tap is an indispensable tool, and, consequently, is not adjustable. Modern dies, on the other hand, are all adjustable."

Therefore, in this particular case, where the limiting profile was so far the official standard, the French Permanent Standardization Commission has adopted the basic hole system, and apparently with good reason.

An opposite position on the matter has been taken by the British Standardization Committee, which has adopted the basic plug system in its British Standard Fine Thread series. In general mechanical practice, however, where the two really competing systems are the basic hole system and the basic shaft system, the French Standardization Commission seems to prefer the third system, to judge by the table given. The commission does not give any reason for its choice.

The German Standardization Commission has adopted both the basic hole and basic shaft systems. This evidently is not a solution of the question, as standardization has for its chief object the interchangeability of parts and this result is certainly not obtained if it is possible, say, for automobiles to pass out of one shop with holes of basic dimensions and out of another shop with shafts of basic dimensions.

In view of this indecision, Pfeleiderer, a member of the German Commission, proposed another system. According to this, both the male and the female parts vary simultaneously, as in the limiting profile system; at the same time, the idea in this case is not the location of the nominal dimension within the range of tolerances, but a reduction of the number of gages required. The object aimed at, therefore, is of a more practical character. This system has been called the Tauschlehr system, that is to say, system of interchangeable gages, because the same gages may be used for different classes of fits. The system works as follows: Suppose that for a given nominal diameter we have three plug gages and three snap gages. These six gages may be chosen in such a manner as to permit of nine different combinations of plug and snap

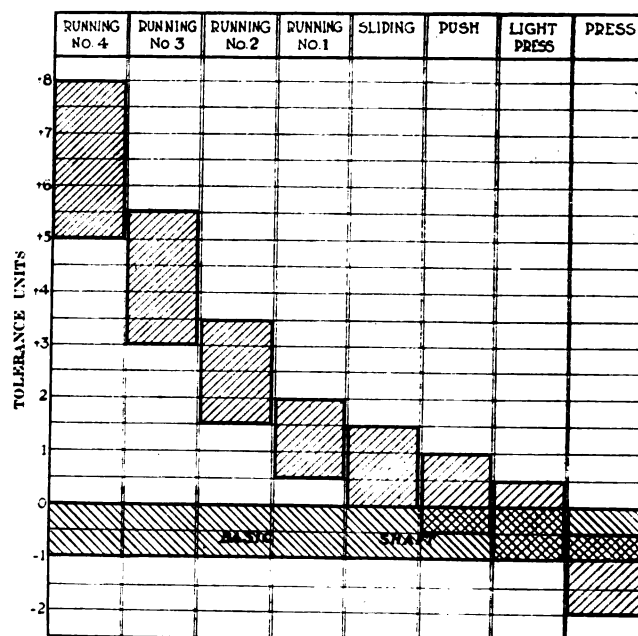


Fig. 4—German standards for tolerances and allowances for fits of moderate precision under the basic shaft system

gages, corresponding to nine different classes of fits. With the basic hole system one plug and nine snap gages would be necessary for these nine classes of fits and, with the basic shaft system, one snap gage and nine plug gages; in either case, ten gages would be required in place of six.

In conclusion, the basic hole system, being the simpler and the most widely used, seems to be the preferable one for general mechanical use.

Division of Tolerances

It is not sufficient to choose between the basic hole and the basic shaft systems, but it is also necessary that the partisans of either of these systems be brought into accord regarding the manner of fixing the tolerances. Unfortunately, this is still far from being accomplished. There are those who favor symmetrical tolerances, with respect to the nominal dimension, either for the basic hole or the basic shaft; there are also those who favor unsymmetrical tolerances, either entirely positive for the bore (basic hole) and entirely negative for the shaft (basic shaft).

Those in favor of the symmetrical system maintain that, other manufacturing conditions being equal, their system is more precise than the other, for the reason that the error in diameter in that case is at most only one-half of the tolerance, while with the other system, with the tolerances entirely unsymmetrical, it may attain a value equal to the total tolerance. This, however, is only a theoretical advantage, because the tolerances are determined in such a manner that the clearance between the two parts is comprised between a maximum and a minimum which have been well determined, but practically it makes little difference, in the case of the basic hole, for example, that the real diameter of the bore differs from the nominal dimensions by some ten-thousandths of an inch.

Some other arguments in favor of symmetrical tolerances were put forward by M. Ailly, in an article in *Le Genie Civil*. If in an assembly of a journal and bearing, for instance, it is desired to reduce the tolerance on the journal and on the bearing without changing the theoretical clearance, the nominal diameter of the part is not modified, and in consequence, the nominal dimensions in

the working drawing need not be changed, in passing from the manufacture with large tolerances to the manufacture with reduced tolerances. In the case of the unsymmetrical system, the nominal diameter of the journal would be slightly changed.

There is still one other advantage connected with the symmetrical system. In case a lot of parts have been machined to a tolerance T and it is desired to reinspect them, reducing the tolerance to $T/2$.

In favor of the unsymmetrical system it is pointed out that it permits of employing, in the inspection departments, gages of nominal dimensions as tolerance gages, provided the tolerances are entirely below or above the nominal dimension. It is difficult, however, to see what advantage there may be in this possibility.

If, with symmetrical tolerances, there are chances of having some bores exactly of the nominal size (in the case of the basic hole system) it is quite certain that this will never occur with unsymmetrical tolerances, for the reason that if a plug of the exact nominal diameter penetrated a hole without effort, this hole necessarily would be of larger diameter than that corresponding to the nominal size.

Tolerances entirely unsymmetrical might have presented a certain advantage if it had been possible to divide the range of tolerances into two distinct fields, but what was said with regard to the limiting profile is also applicable here, namely, that certain classes of fits make an overlapping absolutely essential.

The real argument of the partisans of the completely unsymmetrical system is that the value of the clearance or of the overlap is immediately apparent; this is evidently most interesting to lazy spirits.

One-sided tolerances are in favor in the United States and in Great Britain, whereas symmetrical tolerances seem to be favored in France and in Sweden. The German Standardization Commission also has adopted one-sided tolerances. It is, therefore, apparent that both systems of tolerances have something in their favor, but it is rather desirable that one of the two should be adopted as standard, and that everyone should conform to it.

Considerations of economy demand that work should not be held to any closer limits of precision than is absolutely necessary, whence the necessity of dividing fits into different classes according to the degree of precision desired.

In the French *Precision Mecanique*, provision is made

for two degrees of precision, namely,

1. Fits of high precision;
2. Fits of moderate precision.

The Germans distinguish between four degrees of precision, as follows:

1. High precision fits (Feinfeinpassung).
2. Moderate precision fits (Feinpassung).
3. Low precision fits (Schlichtpassung).
4. Coarse fits (Grobpassung).

Each group comprises a certain number of classes or families, corresponding to conventional fits. Following are the classes provided by the *Precision Mecanique*:

1. High precision fits—running, sliding No. 1, sliding No. 2, press.
2. Moderate precision fits—running, press No. 1, press No. 2.

The Germans have adopted a very much finer classification, as is shown by Figs. 1 to 4 herewith. They provide four classes of fits for high precision (running, sliding, push and press). In the moderate precision group, there are the same four classes, increased by four classes of running fits, together eight classes. There are, moreover, four classes of fits for low precision assemblies and two classes for coarse assemblies.

It is generally admitted that the values of the tolerances and of positive or negative allowances are empirical functions of the nominal dimension; but there exists considerable difference of opinion regarding the form of these functions. The German method of determining these allowances is based on the unit tolerance called *Pass Einheit* and designated by P.E. This unit is defined by the following equation:

$$1 \text{ P.E.} = \frac{1}{200} \sqrt[3]{D}$$

D being the nominal diameter. The minimum total tolerance for plugs and holes is 1 P.E. Tolerances and plus and minus allowances are divided as a function of this unit, as shown in Figs. 1 to 4. The cross-hatched rectangles represent total tolerances of different gages for fits of high and moderate precision for the basic hole system (Figs. 1 and 3) and the basic shaft system (Figs. 2 and 4) in metric units.

If the unit tolerance is expressed in thousandths of an inch and the diameter in inches, the formula becomes

$$\text{Unit tolerance} = 0.58 \sqrt[3]{D}$$

New S-11 Headlight Bulbs

A NEW type of bulb for electric headlights and spot lamps has been developed by the National Lamp Works of the General Electric Co. The new product is claimed to insure greater accuracy in light center length and axial alignment than the old style of lamp.

The filament comes at the center of the spherical section of the bulb with the result that the image of the lighted filament reflected from the interior bulb surface is superimposed upon the light source instead of appearing as a separate source. Increased mechanical strength is accomplished through a more uniform distribution of the glass and a more favorable contour from the greatest diameter to the base. The decreased bulb diameter and the change in the contour of the bulb provide greater clearance between the lamp and the reflector surface, and reduce the likelihood of marring the polished surface when cleaning or inserting lamps.

In addition to these advantages in optical and physical properties, there is an incidental economy of space in packing due to the shape of the bulb. To simplify the

change from the old to the new standard and to accomplish the transition as smoothly and rapidly as possible, the new lamp was so designed that there need be no change made in the lighting equipment other than the direct substitution of the new lamp for the old one in the same receptacle.

In the type designation of the bulb, the numeral represents the eighths of an inch the bulb is in diameter. In the days of carbon filament lamps the bulb diameter was $2 \frac{1}{16}$ in. (G-16½). When the tungsten filament replaced the carbon filament the bulb diameter was reduced to $1 \frac{1}{2}$ in. (G-12) and further technical advancement has permitted of reducing the bulb diameter to $1 \frac{1}{8}$ in. (S-11).

Correction

On page 703 of AUTOMOTIVE INDUSTRIES for March 18, 1920, the displacement of the FU model of Waukesha engine is given at 389 cu. in., whereas the correct figure is 289 cu. in.

The Effect of Labor Conditions on British Production

Although scores of British plants were almost remade by the war, lack of labor saving equipment and the failure of employers to promote better relations with their men have been serious drawbacks in obtaining the desired high output. Some of these factors are explained in this article.

LONDON, ENGLAND.

AFTER an interview "in financial and industrial quarters," presumably but not necessarily British, Joseph W. Griggs, the London correspondent of the *New York World*, writes that the "working tone" of Great Britain has improved. His optimism appears to be due more to appearances than to the realities of the situation, as they are known to those who live and work beneath the industrial surface.

He thinks the labor outlook has become brighter in consequence of the ending of the railway and transport workers' strike and, had he waited a week later, he could have pointed further to the ending of the moulders' strike. Both events, if they stood alone and if the strikes they concern had occurred *before the war*, might justify an optimistic outlook, but one of the results of the war period is the larger organization and unification of labor, whereby a quarrel in one section may readily precipitate a struggle with the mass. At the moment, it is true that the outlook is much better than it was last autumn when the moulders struck but this result merely means that more men are at work steadily, so that, in noting the increased output, reference must also be had to the vastly larger number of people at work.

Relative Outputs

From this standpoint, it may be doubted if relatively the output of British factories—that is to say, engineering and motor works—is as large as it was before the war when it is reflected (1) that the standard work week is now 48 hr. (it is 47 in some places), as compared with 54 hr. before the war, and, (2) that the workers and the factories are technically better equipped. The fact is that scores of British factories have been remade by the war. The motor manufacturing trade is a ready case in point; chiefly in respect to improved plants, better grade materials and larger sources of supply of materials and the influx of more skilled technical workers, such as tool and jig-makers, viewers, inspectors, etc., mostly from the aircraft service.

On the debit side, the automotive trade seems still lacking (1) organizers of output and work setters of the sort who can combine output with good relations with the men and (2) certain labor-saving equipment as distinguished from machinery for output. It is only recently that such appliances as gravity conveyors for passing parts from machine to machine have found a place in British motor factories and even now such labor savers are almost limited to factories staffed by Americans. The same remark holds true of presswork plants and it seems as though the moulders' strike has given a fillip to interest in that class of work, apparently not for the intrinsic or technical

benefit, but rather as a means of avoiding the employment of union labor on casting.

The E. W. Bliss Co. has some big orders in hand for British motor factories for their big press work, some of these orders, it is understood, having a value of \$250,000, and this despite the exchange rate being so unfavorable to the British buyer.

Imports from America

Other factors that cannot be ignored in any reference to the British trade outlook are the continued large import of American vehicles and the high prices at which they necessarily must be sold in Great Britain. In January, Great Britain imported 2997 vehicles, probably nine-tenths of them from the United States, whereas in January, 1919, the import was only 19. In January of this year, British vehicle exports were 309 as against 59 in January, 1919. Large as is this proportion, its significance is emphasized by the fact that such a car as the Maxwell, listed in 1919 at \$985 in America, is sold in England at \$2,500 (at pre-war rate of exchange).

The outlook seems likely to be more favorable to the importer of American cars because of the withdrawal automatically of the 33½ per cent import duty which is due to come into effect in a few weeks unless the legislature decides to continue the impost. At present the British importer of American cars is prejudiced to the extent of over 60 per cent, but, despite this fact and the further one that the exchange is more favorable to the exporter of European cars, there is no difficulty in disposing of all American cars of which at least forty makes are represented here.

Another factor to be noted is the almost unanimous determination by vote of the British engineering trade unions against piecework in any form, a decision which has since been followed by the carpenters' and joiners' unions. Rightly or wrongly, organized British labor seems to be getting into line in opposition to any form of payment assessed by output. It remains to be seen to what extent such a step will prejudice, and even preclude, the ability of British car makers to compete with imported vehicles. It does not follow that it will operate adversely, because (1) it is as much a matter of organizing output by means of labor-saving equipment and expediting batch work automatically, without its being in the power of the workers to hinder it, as it is of continuing to assess the human element as the chief determinant of output, and (2) with the high cost of living the workers must realize that competition is the economic factor most concerned.

In a year or so, American-run factories in England will be competing in output with the older British factories and, following the Ford precedent, the results are likely to show that most of the talk and fear about restricted

output and the policy of "ca' canny," as it is called, have no stable basis, and that the British worker has not the double or even treble dose of "original sin" with which he is debited.

Co-operative Production

Lastly, there is a remarkable trend here toward the co-operative production. So far as concerns the concrete realization of communal production, it is limited to the building trades in the Manchester district of Lancashire. There the workers in those trades have drawn up a scheme practically based on the pre-reformation guilds of handicraft workers and propose to build houses for the municipal authorities at 10 per cent profit on the net cost of outlay. Part of this sum is to be spent on up-to-date plant and tools, the materials, wages and plan generally being financed by the Manchester Municipal Council. It is expected that a considerable monetary saving will result and that a much superior house will be built, the workers having expressed their determination that they will no longer put in good work exclusively on houses for the rich and put up shoddy places for their own class. Moreover, this step is an effort to break up rings in the building trade, which are no benefit to the workers. The guild's ideal is being discussed favorably, more particularly in all the big centers where the need for housing is great and portends a likely wholesale development and application to other trades. The immediate bearing of this sort of enterprise on the motor trade is of a two-fold account.

It suggests a trend of organized labor against the capitalistic system and toward extending co-operation in manufacture to the profit of the many, and it portends an increase of wealth among the workers, whose aim and justification for much of their present tactics are plainly stated to be something more than the living wage, with the certainty that the higher standard of opulence will enable them to own motor cars.

Summary of the Situation

The points so far advanced in this reference to Mr. Grigg's recent optimism merely touch the fringe of the subject, which is really the relation of British labor to capital. Competent thinkers of mature years, having the experience of British industry which only years can give, believe that a tremendous change is impending. The fol-

lowing summary may serve as an index to the situation and outlook as seen by the writer:

There is plenty of work in the engineering trades at large. The automobile industry is no more prosperous than others, largely being dependent on and a reflection of the prosperity of national trade.

British automotive output is increasing but not as fast, relatively, as the output of ships and other lines.

Shortage of materials is the immediate cause, but the chief causes to be anticipated are economic factors, such as (1) the vicious circle in which the rise of wages fails to catch up with the increased cost of living, (2) the suspicion and knowledge that profiteering exists which could be checked, (3) the increasing number of capitalistic trade combines which the promoters justify as a measure of protection against the menace of labor, (4) the claim of labor to dominate production to be the first and largest charge on its profits, (5) the bad international situation in Europe, (6) the conviction that a change of government is essential and that for Great Britain only *free trade* will stabilize affairs industrial and economic, and (7) the necessity for bringing to an issue the gathering struggle of labor against capital, to settle which side shall predominate.

Industrial Unrest

This last factor is probably the most important and far-reaching, for it comprehends such issues as nationalization of certain public services and automatically must determine the immediate fiscal policy of Great Britain. *Industrial unrest is rampant*, despite the call for wares, and the issues now have the accumulated pressure of a five-years' war truce accentuated by war-time experience and the growing internationalization of the European labor outlook. Americans can hardly realize the labor situation in Great Britain, if only because of the importance of *organized labor* being relatively so different in the two countries. The British workers to-day are organized and "unionized" to about 80 per cent of their number. In the United States, as the recent miners' strike showed, organized unions are a minority. An action such as that against the miners' leaders in the United States would have produced a national revolt in Great Britain. Mr. Griggs notwithstanding, the industrial outlook here is bad.

Fabroil Gears for the Camshaft Drive

THE Fabroil gear was originally developed by the General Electric Co. to eliminate gear troubles in their own factory. The object of the designers was to find a gear that would be as strong mechanically as the cast iron gear, but that would eliminate the noise that is such an objectionable feature of all metallic gear trains. After exhaustive research, during which many materials, both metallic and non-metallic were considered and tried, it was found that compressed cotton was the material best suited for the purpose.

In the construction of these gears cotton is wound around a drum, and compressed hydraulically to the proper dimensions. When the gears are sufficiently compressed, they are drilled for threaded studs, which hold the steel shrouds at the required distance to maintain the pressure on the cotton filler.

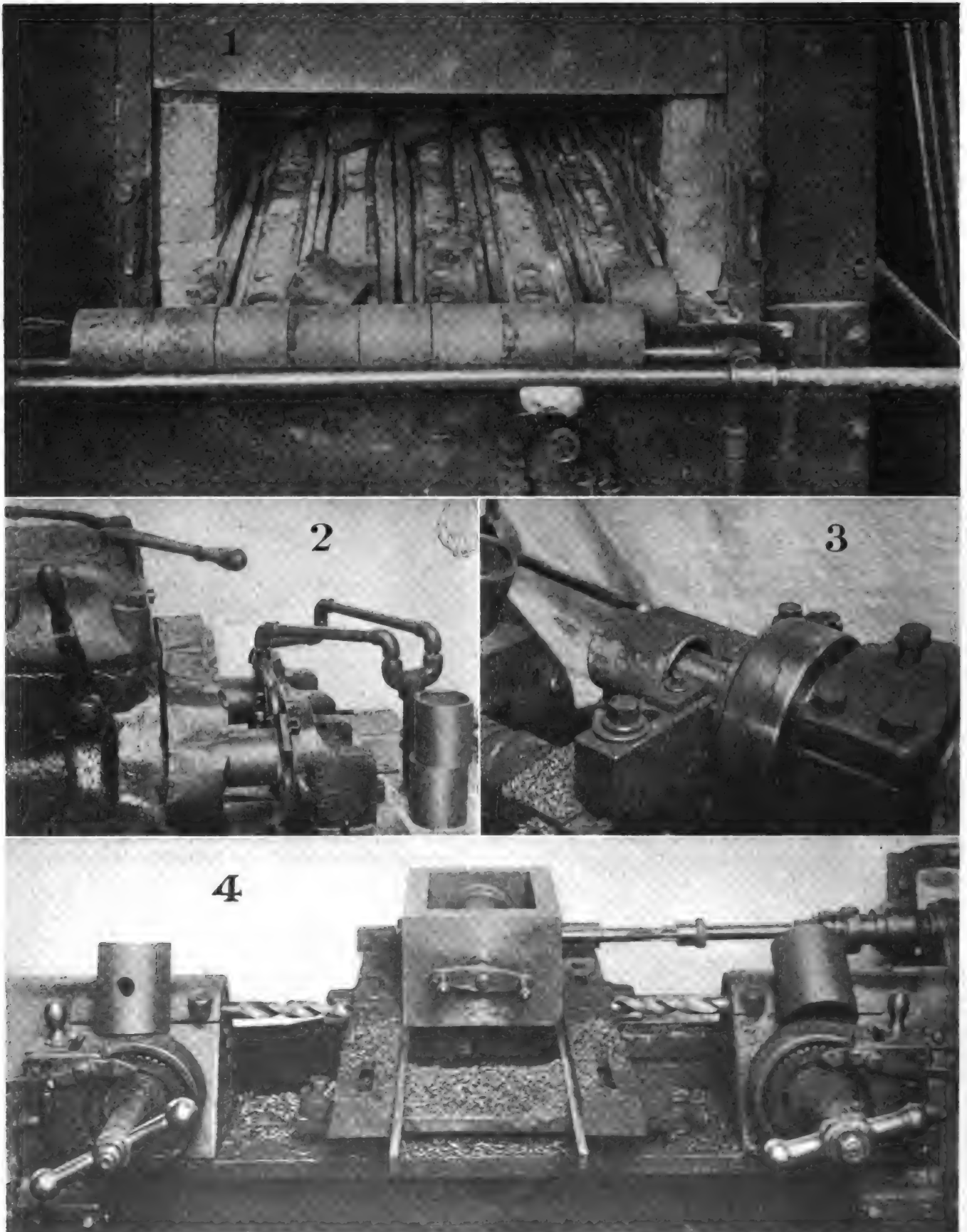
The resulting gear is claimed to be just as lasting as the best cast iron and not easily affected by steam, hot water, or contact with oil, either hot or cold. It is unaffected by atmospheric changes and can be stored for a long time without fear of its shrinking away from the

shrouds or disintegrating. It is absolutely noiseless in operation.

A special type of the Fabroil gears has been developed for use on automobiles, in the timing gear trains, either as camshaft gear or idler gear. These gears are constructed to withstand high tooth pressure, shocks, and vibrations, and their use has helped to solve the rather difficult timing gear problem.

In these gears the steel shrouds are usually of L section so as to strengthen the construction while holding the cotton filler in compression. By a series of processes, the fibers of the filler are made to assume positions paralleling, or nearly so, the outline of the tooth profile, alternate layers crossing to parallel opposite profiles. This produces a triangular truss structure which develops the maximum strength and resistance to wear, without sacrifice to elasticity.

We understand that up to date about forty manufacturers of automobiles and gas engines, including Peerless, Locomobile, Oldsmobile, Continental and Northway, have adopted these gears for their engines.



1—Progressive annealing furnace with inclined track. Door is opened at regular intervals and three rows of castings are taken out. Each casting gets about 90 min. in this furnace at 1400 deg. F. 2—Base operation on casting accomplished on Bardons & Oliver special piston opening machine. 3—Rough turning outside of piston and facing head. Note tool housing, which contains four Stellite tools used two at a time, first two for turning operation, second two for facing. 4—Cross boring and reaming pistons. Note jig on track which carries pistons from cross drills to reamers

The Production of Automotive Parts in the Small Town

Manufacturing conditions in such communities differ greatly from those in the larger centers. Mr. Schipper has taken a typical one and describes the making of pistons, the plan of manufacture being careful.

By J. Edward Schipper

SOME of the most successful parts manufacturers in the automotive industry are located in small towns. Once established there, a manufacturing concern enjoys all the advantages peculiar to a rural community. On the other hand, there are problems of labor and of handling production which are separate and distinct from those of a factory located in a large town or city. As a matter of fact, even the routing operations and the handling of tools are affected by some of these peculiar conditions, and it is of interest to relate how one concern has adapted itself to such conditions so that, with a fairly small plant and a moderate number of men, it turns out a remarkable product. The plant under consideration is that of the Spencer-Smith Machine Co., located at Howell, Mich., which is a junction point of the Ann Arbor and Père Marquette railways.

The plant, with a factory space of 14,000 sq. ft., is producing 4000 pistons per day for some of the leading concerns in the industry. Among these are the manufacturers of the Allen, Briscoe, Chandler, Hudson, Hupp, Mitchell, Oakland and Olds cars, and the Buda, Continental, Cushman, Erd, Herschell-Spillman and Supreme engines. In addition to those factories, the Spencer-Smith company also supplies many jobbers with replacement pistons for Ford and Dodge cars.

The present output of about 12,000,000 pistons per year, is attained with a force of only 154 men. Plans of recent date call for an increase of floor space to 26,000 sq. ft., which would give a capacity of 6000 pistons daily and admit of employing approximately 200 men. The additions will be ready for occupancy during June.

In a plant of such size, the familiarity of the men with one another and with the management largely eliminates the professional agitator. Grievances are dealt with frankly and there is no discontent. There is, however, a problem in the education of productive labor. The workers in a town of this size are, largely, the sons of farmers from the surrounding communities. They must be educated to machine-shop work, in which they have had no experience, as a rule, when entering the plant. It has been found essential to educate the men to do one particular job well and a training of three weeks is considered sufficient to enable a raw farmer boy to take his stand in the company's production line.

The aim of the production department is to simplify and to unify each job, so that it is only necessary to instruct one man to take care of one unit in the productive plan. It has been found desirable to make each man's job independent of the next man's, as far as possible. A typical instance is that of cutting ring grooves. Under ordinary conditions, either the ring grooves would be roughed and finished on an automatic machine, or, if the

job were not automatic, one man would take care of the roughing and the next man the finishing of the ring grooves.

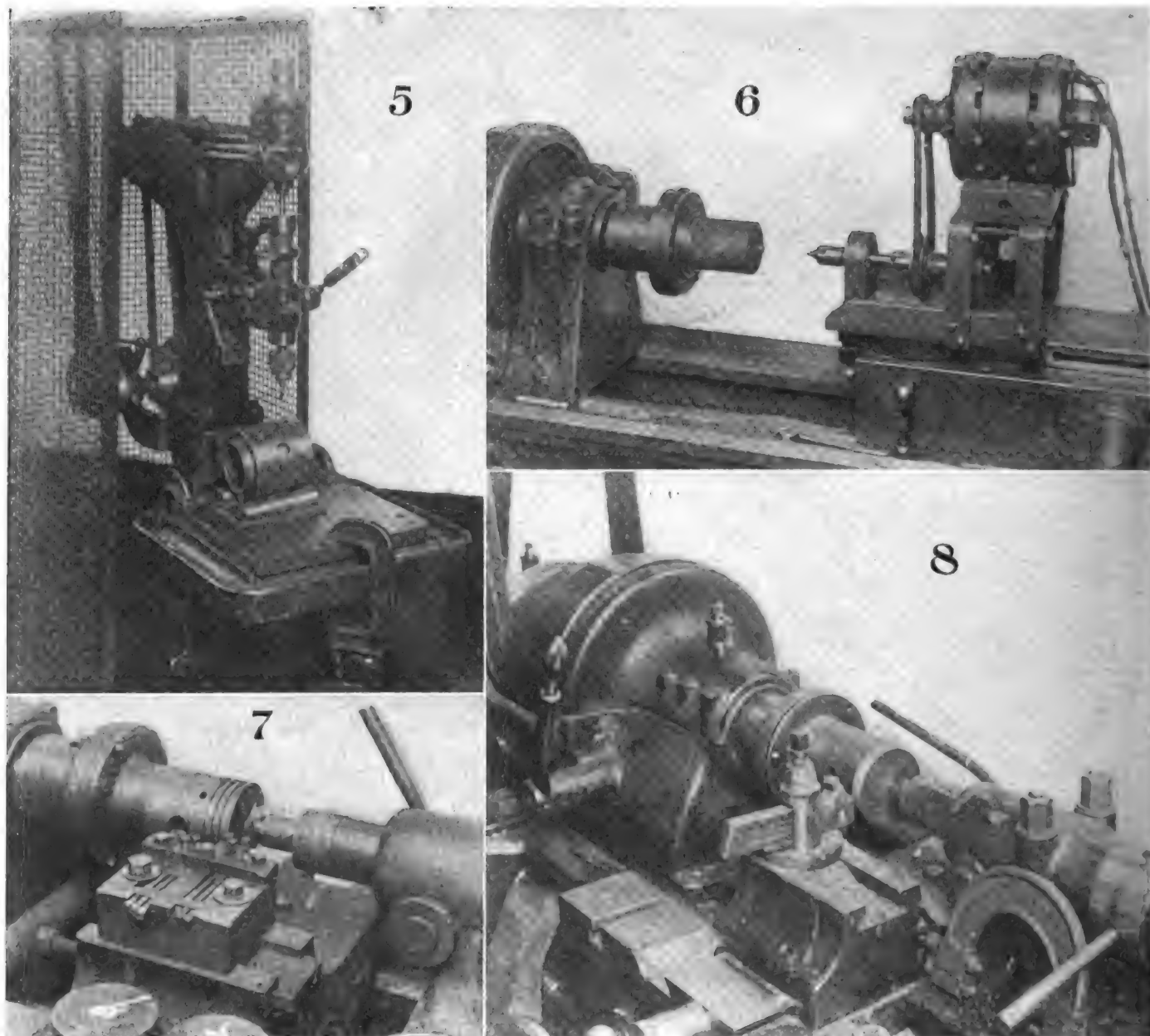
In the Spencer-Smith plant, the ring-groove cutting job is unified and one man on a specially adapted machine takes care of both the rough cutting and the finish cutting, which not only simplifies instruction of the man but results also in a saving of tools. This is evident when it is considered that, since the roughing cut need not be to as close limits as the finish cut, it is possible with the rough cut to take off sufficient metal so that the finish cut is very light, with a consequent longer life of the finish-cutting tools.

Another interesting matter is the method of location, which differs essentially from the practice employed in many piston manufacturing plants. It has been found that, if the rings are rough-cut before the bore is finished, distortion often throws the inside bore out of round. For this reason, the practice in the Spencer-Smith plant is to rough the piston all over before any finish cuts are taken. Under present foundry conditions, hard castings are more frequent than formerly. However, the percentage is reduced to below the normal by annealing every piston. In this plant about 20,000 lb. of cast iron is started through the plant in a day. The metal lost in manufacture runs about 40 per cent, so that, of the ten tons of raw castings, about six tons of finished pistons are produced. The piston casting weight averages about 4½ lb. and the finished product about 2½ lb.

While the individual steps for manufacturing different pistons vary to some extent, they all follow the same principles. However, to concentrate attention on one particular type and to follow its manufacture from one end of the plant to the other, the piston for the Mitchell car is chosen as an example and the following description of its manufacture is based on the chain of necessary operations.

All the castings for Mitchell pistons, as well as the others, are annealed on a progressive base in which the bed of the annealing furnace has an inclined track (Fig. 1). The castings are put in at the top of this track and pass through the annealing furnace, being taken out, three rows at a time, at frequent intervals so that each piece is in the furnace about 90 min. The annealing is done at 1400 deg. Fahr. The annealed castings are placed in a bin, which shuts off the outside air, and allowed to cool slowly. The heat of the pistons raises the temperature of the room to such an extent that slow cooling results.

The first machining work is known as the base operation, in which the pieces are opened and faced (Fig. 2). The casting is located from inside on an expanding mandrel. The chuck is double expanding, and it holds the piston at two independent points while the base operation



5—Drilling smoke holes on Avey sensitive drill with rotating jig arbor. 6—Centering operation accomplished by high-speed cutter driven by super-imposed electric motor. 7—Rough cutting and finish cutting piston pin grooves on common engine lathe with special tool blocks, making this a unit operation. 8—Finish-turning, the piston being driven from the piston pin boss and located from the base operation.

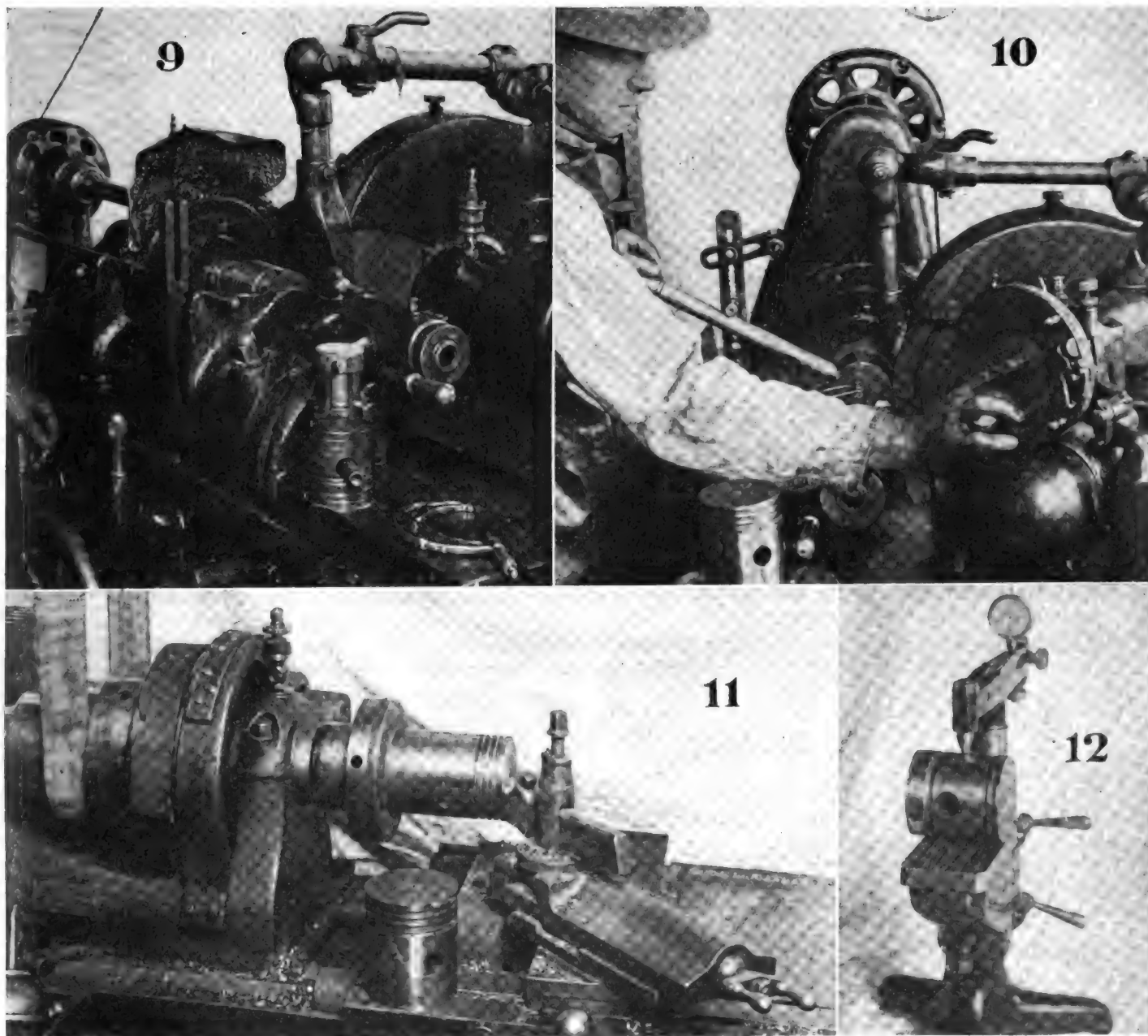
is accomplished. This consists of boring the open end and facing the bottom end. It is the only machine operation on the bottom face and it forms the basis of location for practically all of the succeeding operations, the object being to obtain a uniform wall thickness. The operation is accomplished on a Bardons & Oliver special piston opening machine, which has a capacity of about 125 per hr.

After the base operation is complete, the first manufacturing work is to rough-turn the outside and rough-face the head (Fig. 3). Location is from the open end, which has been fixed by the base operation. A Jones & Lamson double-spindle turret lathe, having a tool housing with four Stellite tools, is used. Two of these operate at one time. In the facing operation, the head moves, carrying the work, and, in the turning operation, the table moves. The machine has a capacity of 70 per hr. After the rough turning and facing has been completed, the opening is finished with a floating reamer to a limit of plus and minus 0.001 in.

In cross boring the piston pin, Fig. 4, location is made from the face and base operations, and also by V-blocks, which set against the piston-pin bosses. A screw clamp holds the piston boss against the V-blocks. The boss is then drilled from both sides simultaneously. The jig is on a track and the machine carries the reamer outside as well as the drills. Immediately after drilling is completed the work is moved over for reaming, the machine being a Garvin, double-spindle, horizontal drill. The work is held to limits of plus and minus 0.001 in.

With the same method of location, the centering operation, Fig. 6, is completed with the casting held by an air drawbar chuck. The work is done by a centering spindle which is given sufficient speed by a superimposed electric motor to relieve strains in the metal. The drill turns at about 2,000 r.p.m. and is the standard $\frac{1}{8}$ -in. centering size.

The base operation is used also to locate for finish turning. The center established by the centering opera-



9—Grinding operation, showing special arbor in foreground. This arbor locates from the base operation and piston pin centers. The grinder is a Landis, using a Norton Crystolon grain 36 L or M wheel. 10—Concentric grinding of piston relief. Note crossbar in the piston pin hole with a stop to carry the piston around a required radius for the relief. 11—Finish facing piston head. This is a very high-speed operation, the machine having a capacity of 200 per hr. The tool is Stellite, as are practically all of the tools used in this shop. 12—Inspection with amplifying gage, giving readings to 0.0001 in.

tion described also helps to secure proper location for the finish turning, Fig. 8, and the work is driven from the piston pin boss by an internal chuck. The finished turning job leaves from 0.015 to 0.020 in. for grinding. The tool is a LeBlond rapid production lathe with a cutting speed of 160 ft. per min.

After the piston has been finish-turned, it is ready for the ring grooves, which are cut on a plain engine lathe, Fig. 7, provided with a power cross-feed adjusted for slow feed. There is a double tool block on this lathe, one part being set for rough cutting the ring grooves and the other set with cutters for the finished cut. This is the operation referred to in the foregoing, where it was stated that one man handled both the rough and finished cutting. The machine has a capacity of 60 per hr. In addition to cutting the ring grooves, it also puts the smoke hole land on

the piston. This land is a face cut at an angle to the center line of the piston at the bottom-ring groove. Through it are drilled the small oil relief or smoke holes.

The smoke holes are drilled on an Avey sensitive high speed drill with a rotating jig, Fig. 5. A woman operator takes care of this work, which is light and requires but little tool attention. Ordinarily, at this point the bosses would be drilled, but on a Mitchell piston this operation is not required. There are oil grooves, however, on the piston skirt, which are cut in a plain engine lathe with a special tool block. This lathe handles 175 pistons per hr.

The piston body and land are ground on the same operation on a Landis grinder at the rate of from 75 to 90 per hr., Fig. 9. The grinding limits are the regular commercial limits of plus and minus, 0.0005 in. About 0.015 in. of metal is taken off. The grinding operation is located

from the base operation and the center. There is a special arbor which holds the piston against this location and which also squares up with the piston pin center. The wheel used is a Norton Crystolon grain 36 L or M. The grinding wheel runs at from 5500 to 6000 r.p.m. There is only one grinding operation for size. There is, however, a relief grind concentric with the piston and located from the open end. There is a crossbar in the piston-pin hole, with a stop to carry the piston around a radius for the relief, Fig. 10. The cutting is done on a Landis grinder.

The finish facing operation, Fig. 11, is done rapidly, and the cutting is by means of a Stellite tool with an exceptionally rapid feed. No lubrication is used on the cutter, as the piston passes to a polishing machine immediately after and it is necessary that it reach this polishing machine in a dry state. The finish facing operation is done at the rate of 200 per hr.

After polishing, the pistons are inspected. This is taken care of with amplifying gages, the first step being to size the piston with an amplifying dial gage reading to 0.0001

in., on the body and land. The depths of the ring grooves are sized and the squareness of the piston-pin hole to the center line of the piston is tested. The width of the ring groove is then tested and the pistons are arranged in oversizes of 0.001 in. In connection with the amplifying dials, full length set gages, Fig. 12, are used so as to give certainty on the reading. In addition to this final inspection, which is handled by women, floor inspections are made frequently by the foreman of each shop department.

The payment to the workmen is all on a piece basis. This fits in well with the segregated, individual scheme, which has been outlined. There is no gang work on these pistons, each operation being made to stand alone. The time rate is set and the earning capacity of the man or woman on the job depends on the individual's speed in performing the operation.

The plant, being situated on the two railroads, has exceptional shipping facilities and, so far, it has been unaffected by congestion or car shortage. The pistons leave the factory in as great a quantity as a carload lot at a time.

Difficulties of Operating Industrial Pension Plans

THE six fundamental problems confronting the manufacturer who is operating or who is contemplating the establishment of an industrial pension plan were outlined in the report recently submitted to the Merchants Association of New York by its Special Committee on Industrial Pensions. The report is based upon a careful investigation of a number of industrial pension plans now in operation and upon a large amount of other material related to industrial pensions gathered from all over the country by the Industrial Bureau of the association.

Briefly summarized, the six fundamental difficulties in the establishment and operation of an industrial pension system, as determined from the results of this survey, are:

1. No pension system should be started without competent actuarial guidance. The management and stockholders of a corporation are entitled to know whether the corporate treasury is to bear the whole or a portion of the pension cost and what this cost will be. The employees are entitled to a pension system which has set up an actuarial balance over the years in which any one of them can expect to be affected.

2. The problem of accrued liabilities is a fundamental one. These are the liabilities with which a pension system starts, owing to the previous service of an employee when there was no pension system. Unless a pension system starts right, it is doomed. The accrued liabilities must be cared for.

3. The legal obligation laid upon a corporation should be carefully considered. The corporation does well to provide that it reserves the right to alter the rules. On the other hand, such reservations should be prospective only; they should never take effect retroactively. Employees cannot be expected to enthuse about a plan which the corporation reserves the right to modify or abolish at any time without fulfilling promises already made.

4. The money of the pension fund should be kept entirely separate from other resources of the corporation.

5. The solvency of a pension fund is not only dependent upon its original foundation but also upon the administration after it is set up. A pension system cannot be entrusted merely to clerks. Changes, modifications and alter-

ations are likely to be necessary in any system and, when they are necessary, they should be determined with care and executed effectively.

6. A pension system usually has, as one of its primary objects, the benefit of the employees. For this reason it is advisable to frame the pension system and install it in cooperation with some committee or group of employees.

The report of the committee further states that the employer cannot expect to see immediate and direct returns from the establishment of a pension system. It believes, in fact, that the success and value of any pension system cannot be justly and properly determined unless it has had almost a whole generation to prove its success or failure.

How Trailers Affect Highways

NUMEROUS laws having been passed restricting the use of trailers in various States, the Trailer Manufacturers' Association has gone on record as opposing such legislation and has given out or directed attention to interesting data relating to the effect of trailers upon the wear and depletion of highways. Reference is made to the New Jersey law, which prohibits the use of more than one trailer with a motor truck. The law is thought to have been passed under the mistaken idea that a train of trailers obstructs turns in highways and endangers other traffic. As trailers are designed and built today, the wheels follow in the tracks of the towing vehicle and corners can be turned without crowding other vehicles coming from the opposite direction or from behind.

Instead of adding to traffic congestion, the point is made that a train of vehicles will cause less delay at crossings than would be the case if such vehicles were strung out into a long line of separate units. The increased haulage also lessens congestion at terminals. As to the wear on the roads, the distribution of a load to a number of axles tends toward less pressure per wheel and less wear on the roadbed. The tendency to overload is certainly less if trailers are used, for the evident reason that there is greater available space in which to distribute the load.

Production as Seen Through the Foreman's Eyes

Only the practical side of getting out the work appeals to the plant or factory foreman. He has neither the time nor the inclination to worry over academic theories and abstract ideas. That was why this article was written, the conditions here related having a broad relation to many plants.

THE employment manager of a large automobile concern, whose work extended through the hiring and discharging of men to personnel problems in general, recently made an interesting comment on the relation of the human element to production.

"The foreman," he said, "could well afford to give 70 per cent of his time to the personnel problems of his department. His relations with the men, the effect of their working conditions upon their production, etc., play a definite and important part in the improvement of production quantity and quality."

This opinion came from a man whose interest and knowledge were centered largely upon personnel problems and the human element in industry, so that his high estimate of the importance of the human element is not surprising. The average foreman, however, is not usually versed in the ideas and nomenclature of modern personnel work. His chief aim and his only problem is to get out the production demanded of him in the shortest possible time and at the lowest possible cost.

This brings to mind a foreman that the writer met recently when visiting a small foundry. The foundry itself embodied nearly all of the poor working conditions which numerous commissions, private investigators, and "uplift" workers have chalked up against the record of general foundry practice. It was swept by drafts, heated by salamanders, full of smoke, and blessed with enough dust to fill the lungs of whatever number of men might be working there.

The foreman was an old-timer in foundry work. He had worked in good shops and bad for fifteen years, but always with his mind concentrated on getting out the production for which the management was continually calling. He had no interest in the "human element" side of foundry work. In fact, when asked what his labor turnover was, he did not understand the term.

Difficulties in Employing Men

The trip through the foundry had scarcely been started when he began to tell his production difficulties. "Can't get men to work here," he said.

"I have five more molding machines ready to work and material to keep them going, but I can't get the molders. Men quit all the time."

"How many men do you have to hire to keep your working force up to its quota of 85?" was asked.

"Guess I hire eight or ten a day," was the reply. "Then I have to treat them just right or they quit on me. What's the reason? Well, they can go out to a shipyard or to work of some other sort and earn more than they make here and get pleasant work and working conditions. We pay laborers 50 cents an hour and molders \$7.04 a day."

"Do you think working conditions have much influence on production?"

"Certainly. Look at me. I've just got back on the job after being off for five days. It's the smoke that gets you; a man can stand it only so long. Then he has to lay off for a few days and 'blooey' goes your production schedule."

Ventilation and Smoke

The writer happened to know that this foreman had lately worked at another of the company's foundries which was housed in a new building and contained modern equipment. So he was asked, "Wouldn't you get much more production in a plant like your ———, for instance, with good ventilation and much of the smoke eliminated?"

Once again the withering look. "I should say so. Why, in that other plant of ours, which is just half as large as this and employs just half the number of men, they could get just as much production as we do here if they didn't lack pouring facilities to handle the increased amount of work."

"I can't get men enough to keep this old place clean; I have to try to pound out as much as I can with the men I can get. If I could keep the place cleaned, we could put out a third again as much stuff as we do. Then you would know where everything was when you went to look for it and things wouldn't always be getting in the way."

"What are these salamanders for?"

"They are to heat the place. It is often a question as to whether we wouldn't get along better without the heat and without the fumes than with the heat and the fumes that it generates."

"Then these drafts," he went on. "When the 'flu' epidemic came along last month I had only one molder out of ten. Men working here had every chance to get the 'flu' because they get hot at their work and then a draft blows in through slits like that one in the wall over there and, naturally, the men catch cold. During that time I could get scarcely any production out of this foundry."

"I've been trying to get them to put in a concrete floor, too, over here where we dump the castings out. Look at that mud hole now; it takes a man five times as long to shovel the sand out as it would if there were a concrete block in there."

"What can you do to get men and keep them at work more consistently?"

"Can't do anything. You can't blame them for quitting. Here they are liable to get pneumonia, they get their lungs full of steam and gases and the work is pretty hard, most of it. Next summer, mark my words, we will simply have to shut up shop. If the place were as pleasant to work in as machine shops and shipyards, we could get the men. This old foundry, with its bad conditions, is losing money for the company every day."

To What Extent Is the Independent Repair Man a Manufacturers' Problem?

The manufacturers' recognition that service is a part of the marketing program has tended to make for dealer stability in the automotive trade. Today no worth while manufacturer would consider a sales arrangement that did not adequately provide service. But the question arises as to how far he should go in enabling this dealer to meet outside service competition.

By L. C. Voyles*

IT is, of course, the ideal of every automobile manufacturer to have each and every owner of his automobile satisfied and, while we all appreciate that this is not one hundred per cent practical or possible, yet the nearer we can approach that ideal the better for all concerned. Our position in this matter reminds me of the story of the Kentuckian who was making his annual visit to market to dispose of his produce. His team of oxen was somewhat weary with the two-day journey. When he reached the city limits, he was confronted with the sign: "Speed limit, fifteen miles an hour." He pulled his whiskers a moment, in silent meditation, and then drawled out to his oxen, "Well, I know darn well we'll never make it, but we'll do our doggone best." While we may not be able to reach our ideal, we can do our best.

If it were possible for every owner to bring his car to the factory and have adjustments and repairs made by them, the possibilities of one hundred per cent efficiency would be much greater—but that is out of the question for factories which produce in quantities, or those whose product is distributed over a wide range of territory. It, therefore, becomes necessary to provide some means whereby the purchaser of an automobile in a distant section can get as nearly as possible factory attention. The most practical and satisfactory plan found so far is to make it a part of the dealer's duty to provide for his territory the necessary facilities for the proper rendering of service after the car is sold—not something for nothing. If he is in a position to repair his owners' cars promptly, efficiently and economically, he can truthfully say, in my opinion, that he renders prompt service.

Shop and Equipment

To do this he must have, first of all, proper shop space, sufficient equipment of tools—in all probabilities special equipment must be provided for certain operations—an efficient mechanical force and, last, an adequate stock of parts. Formerly as much attention was not paid to this phase of the business as should have been and we are suffering from that evil today. Formerly the deciding question was: could cars be sold without pulling aside the curtains and peeping at tomorrow? After the dealer has met the above requirements—which usually mean an investment of several thousand dollars—is it fair to him, is it fair to the manufacturer and, last, is it fair to the owner to encourage an independent repair shop in that dealer's territory? I think not.

There are two classes of owners affected by the independent garage or repair man. The first is the one who

deliberately goes to his repair man—knowingly and probably on account of some difference with the dealer—and the second is the stranger or tourist. This latter class may be influenced by signs or other advertising matter on the part of the so-called independent garage or repair man.

If the factory receives a too large percentage of complaints from a certain territory on the service rendered by the dealer, it should be investigated from the factory, to determine the cause and to remove the trouble, even if it means a new dealer. It may be in the personnel of the shop. Oftentimes a mechanic imagines he knows more about designing and building a car than the engineering department ever thought of knowing. He may be trying to redesign and rebuild the cars instead of repairing them. It may be the fault of the car itself in that in this particular location it may be called upon to meet conditions that were not anticipated and, in order to meet them successfully, certain changes will be required in the construction on the part of the factory. This would be particularly true on new models.

Duties of the Factory

But, whatever the cause, it is the factory's duty to correct it through the dealer rather than to attempt to remedy it by encouraging independent garages and repair shops. That would only mean admitting, first, that the dealer's service was not what it should be and, second, that it was not possible for the factory to correct it. Students of political economy are telling us that the surest cure for the present trend of today's Bolshevism is a full stomach. It seems to me that a similar comparison can be made in our own case and say that the surest cure for the independent garage and repair man is to have our dealers' organization so efficient that the other will be unnecessary.

The time is not far distant when cars will be sold through the back door instead of the front door. I mean by this that the service the dealer renders will determine his sales success—even now this plays an important part in the case of a reorder—and the wide-awake dealer is not only ready but eager to do anything that will increase his service, which means sales, and contribute to the satisfaction of his owners. It is, therefore, clear that this is a sales as well as a service problem and calls for the closest co-operation between the factory sales and service department.

The independent repair man's existence, generally speaking, and whatever success he attains, depends in a large measure upon the differences that exist between car owner and dealer; and, rather than increase these differences by

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encouraging the independent garage, efforts should be made by the factory to reduce them by co-operating with, and encouraging, the dealer. For instance, all of you have received letters from an owner telling you the dealer couldn't do this or that and it was necessary to take the car to a friend of his who is an excellent mechanic; he tells him this, that and the other thing is wrong, and that to correct it will mean quite an extensive repair bill. He wants to know what the factory thinks about it and, in some instances, requests the factory to assume part or all of the expense.

In the first place, why shouldn't the repair man tell him this? Self-preservation is one of the first laws of nature and the repair man's whole existence as a repair man is dependent upon the number of cars he can work on. Consequently, he is selling his product in telling an owner these things.

Second, if that owner receives a letter from the factory telling him that the dealer in his city is qualified to take his car and make an examination and tell him whether or not the work recommended is absolutely necessary or not, the chances are this owner is going to stop, look and listen, before he proceeds. The letter may add that the dealer is interested in his success with the car, that his men are intimately acquainted with its construction, that he has the necessary equipment to look after the needs, and, with all due respect to his friend's advice, while he may be a good mechanic, yet he may not be familiar with the particular construction of various units of his car.

Oftentimes the proprietor of the independent garage is a former employee of the dealer who decides to go into business for himself and, logically, figures he can take more or less of the dealer's trade away from the dealer. While we have no quarrel with him for having ambition enough to get into business for himself, yet we must necessarily protect our own interests. There are, no doubt, cases where the man can make amicable arrangements with the dealer and can handle a certain class of work to the advantage of all concerned; but again, this should be worked out through the dealer and the dealer should be held responsible for the service in his territory. It is the unreliable or incompetent repair man and the fellow who has no interest in the owner other than the money he can get from him that we must necessarily object to and protect ourselves against. We cannot refuse outright to sell him parts, but, if no discount is allowed and the owner finds that he can get his parts more promptly through the dealer, it isn't going to be long until he will decide it is to his advantage to have the dealer look after his car.

The Owner's Right

Owners have a right to take their cars wherever they choose but they also have a right, by so doing, to inherit the expense and inconvenience occasioned by such an action. In many cases this former employee will feel, in view of his knowledge, that he can give as good or better work than the dealer's organization and will feel warranted in wording his signs to lead the public to believe that he, officially, is a service station. There is a possibility of legal action, if it can be proven this is done with the intent to deceive, but that is an expensive proposition and is apt to create the false impression that this particular party is being discriminated against and it will tend to aggravate conditions instead of relieve them. The most effective means of combating this is for the dealer to have the various departments of his service so well organized, and so thoroughly equipped, that he can, beyond a question of doubt, render better service than can any small repair shop.

In many instances, these small repair shops will send the car owner around to the dealer to buy parts, feeling

that the owner can buy them to better advantage. This gives the dealer an opportunity to resell his service to that owner. He may have left because of some misunderstanding. This is a chance to win him back and should not be overlooked or neglected by the dealer. A dissatisfied owner is a liability, with no known means of computing the exact damage he can do—while a satisfied owner is an asset, with equal difficulties of getting at the true worth.

The foregoing has figured on a normal dealer in an ordinary territory. There may be cases in a dealer's territory—through having a large or sparsely settled territory—where it is impractical to have all cars brought to him for attention and, on account of the shortage of cars or other reasons, he does not want to establish sub-dealers. In that case, it should be obligatory on the part of the dealer to arrange through some local repair shop for the proper service, but that arrangement should be made by the dealer and not the factory and the dealer should be held responsible by the factory. The dealer should be sure that this party is sufficiently familiar with the working parts of the car and has sufficient equipment to care properly for the customer's wants and, if there is any doubt, either arrange for his own man to spend sufficient time with the owner or have the owner spend the necessary time in the dealer's shop to teach him the individual construction of the car in question.

In Large Cities

Another phase, in a large city like Chicago or New York, is that it might not be practical, from either the owner's or dealer's standpoint, to have each car brought to one point. In such a case, the dealer can take the necessary steps to insure service to the owner or owners in a particular section of the city and this should be the dealer's duty if he is to fulfill his part in the plan of distribution and merchandising.

There are cases where an owner may have purchased a car from a dealer but lives in what is known to the trade as open territory. Here is a condition that should receive the careful attention of the territorial representative. If there are sufficient owners in a certain section, it may be advisable to arrange for service to them through a local man but it should be on a basis of a contract to that effect, in other words, that man should be responsible to those owners for the performance of certain obligations and the factory in turn should be in a position to insist that he fulfill his contract to the letter, instead of permitting an owner to get along as best he can.

Not many years ago, figuratively speaking, a dealer was not sure from one day to the next just where he stood in relation to his contract. Very often, suddenly and without warning, his contract was cancelled, a new dealer was appointed and owners who had bought from the former dealer felt they would not receive proper service from the new dealer. Hence they began taking their cars to other places for work. Thus the factories themselves are largely responsible for present day conditions and, being responsible for them, it is their duty to do the major part in correcting them.

The automobile business has settled to a more solid foundation. One of the most valuable lessons learned is that a dealer is just as much a legitimate merchant as in any other line of business and that in a large measure the reputation of the car itself is judged by the reputation of the dealer. He must be a business man in every sense of the word, he must be capable of caring for the wants and needs of his owners; and, having met these qualifications, he should have every support of the factory whose product he sells—instead of adding still more to the general confusion having the factory encourage the independent garage and repair man.

Selling Motor Trucks to the Concrete Industry

Many motor trucks are already in use in the concrete industry, but many more may be used. The contractor is the best prospective buyer, but producers of concrete materials also offer a good potential market. The particular truck needs of this industry are analyzed in this article.

THE concrete industry is a large potential market for motor trucks, according to a pamphlet recently issued by *Concrete*. Approximately twenty-five million square yards of concrete have been laid during each of the past three years, a construction work which required about 8,250,000 barrels of Portland cement annually.

Some parts of the concrete industry offer a better market than others. The industry may be divided into the following groups:

- A. Consumers
 - Contractors
 - Products manufacturers
 - Engineers
- B. Dealers
 - Materials
 - Equipment
- C. Producers of Raw Materials
 - Cement
 - Sand and Gravel
 - Crushed Stone
 - Auxiliary Materials
 - Equipment

The first group mentioned, the contractors, is by far the most important factor in so far as the motor truck is concerned. The contractor transports much of his own material from the yard to the job, while he carries all of his construction equipment from one job to another. In some cases, he has even found it economical to carry the concrete from the mixer to its place of deposit by means of a motor truck.

It is probable that something like 15 per cent of the concrete trade now owns motor trucks, although accurate figures are not available. In all phases of his work, however, the contractor can use the motor truck to advantage, so that a large field is open to the truck salesman in this direction.

The concrete products plant has to bring in its raw materials, manufacture the finished product and then transport it to the construction job. In performing this work, the motor truck may play an important part and, as additional methods of using it to advantage are found, these plants should be increasing purchasers. In dealing with such plants, the salesman should not underestimate the importance of the engineer. The engineer is often the only technical man in the plant, and, although he does not do the actual buying, his opinion carries much weight and is usually accepted as final on all matters of a technical nature.

The concrete dealers do not, at the present time, use motor trucks extensively. The chief reason for this is the comparatively undeveloped condition of this portion of the industry. Many dealers do not carry stock but sell from catalogs and circulars.

New requirements of the concrete industry have caused the rise of what is almost a new industry in itself—the production of concrete materials. In this new phase, transportation is an important factor. The problem of handling these dry materials, of loading them quickly, transporting them speedily and discharging the load readily is being solved, to a large extent, by the use of motor trucks.

The particular type of truck desired by the concrete industry is confined chiefly to the smaller models. In a general way, it may be said that the 2-ton and 3-ton truck is most in demand, with the small 1-ton truck running a close second. While there are a number of heavier trucks in use, even 6-ton and 7-ton models finding place in some parts of the industry, the proportion of such trucks is not large.

The contour of the country in which concrete work is done is as variable as the contour of the various sections of the country. About an equal per cent of the trucks used are operated in rolling, flat, and hilly parts of the country. Consequently, no general statement as to the requirements of the trade in that particular can be made.

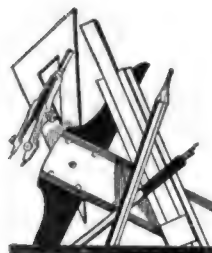
The service rendered by truck agents to truck owners in the concrete industry has not been nearly as good as it might be. Probably 50 per cent of the trucks sold are not "followed up" in a manner satisfactory to the owners.

Trailers are used to a large extent in this industry and more methods of using them are likely to be devised in the future.

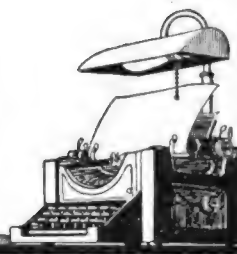
New Cushion Drives

FINAL drives for passenger cars and motor trucks, composed of two or three Thermoid-Hardy flexible disk couplings and tubular steel propeller shafts, are being marketed by Snead & Co. The shaft is made of light gage allow steel tubing, electrically heat-treated. The spider of the universal joint is shrunk over the tube, after which a hexagonal wedge is driven into the end of the tube, thereby expanding it to fit a hexagonal countersink in the spider, and finally tube, wedge and spider are welded together by the electric arc process. After machining, all parts are carefully balanced.

Owing to the use of flexible disk universal joints, the angle at which the propeller shaft can work is limited, and it is stated that a normal angle of 7 deg. when the vehicle is at a standstill and supporting its rated load should not be exceeded. The amount of end motion possible is largely determined by the diameter of the disks employed and their thickness; thin disks of large diameter naturally can take up more end movement than small thick disks. Tubing used for shafts ranges in size from 1½ in. diameter by 16 gage to 2½ in. diameter by 11 gage.



The FORUM



Needed Developments in Motor Traction

Editor AUTOMOTIVE INDUSTRIES:

THE devotion of the American manufacturer to standardization seems to have killed initiative in the design of automotive vehicles. Our motor trucks of all makes are closely similar, taken size for size. All are heavy, semi-rigid vehicles, the majority with solid rubber tires. With the tendency toward the use of the largest possible units, motor truck transportation now requires the heaviest of concrete road beds and is comparable with the railroad in being suitable only for routes where there is sufficient traffic to warrant the construction and maintenance of a most expensive type of road. The enormous area of the earth's surface which is sparsely settled and cannot for centuries support brick or stone road pavements has received no consideration from the designers of automotive vehicles.

The load-bearing quality of the natural soil controls the type of transport that can be used. Without the aid of artificial roads, goods are carried over hundreds of miles, from country to country, by pack mules, camels, llamas, bullock-carts, horse-teams, wheelbarrows and even on men's backs. Some of the trails are too steep and too narrow, by reason of routing through mountains, for any form of mechanical transport except perhaps the cable-way, but the majority of the routes traversed lie over level or rolling country with soil of sand, clay or stones, lacking only artificial road surfacing to permit the use of heavy vehicles, but lacking also the density of population that alone could support the expense of making and keeping up the road. Such country is Siberia, between the rivers and railroad; China, Mongolia, Turkestan, parts of Africa, and in fact, large areas in every continent. Over much of the earth's surface the land dries up in summer and forms a fair natural road surface, if only its bearing qualities are not exceeded by the use of heavy-wheeled vehicles.

New forms of automotive vehicles with larger surfaces bearing on the ground and lower pressures per square inch than are possible with the usual four-wheeled motor truck are urgently needed in many countries. Much has already been done in the direction indicated. The caterpillar tractor, designed for heavy plowing on soft ground, was developed into the heavy army "tank" which could climb grades, cross ditches and even push down walls. Later types were light and rapid in movement, so that they have evident possibilities as motor tractors over open country. All the effort put into war tractor design was, however, directed toward making shot-proof machines, capable of engaging in battle and lasting for a few miles of use (or abuse) until put out of action by accident. The tank-type motor vehicle for commercial transport needs the opposite qualities of durability under reasonably careful operation and smooth, efficient performance with as little noise as conveniently possible.

The four-wheel drive vehicle, or even a tractor with six or more road wheels with flexible framing, might be equally useful if properly developed for service over unworked country. A four-wheeled vehicle would at least

be more easily guided around curves and obstacles and with broad wheel surfaces would not be unsuitable for soft ground. It would, of course, need a positive drive to each wheel, with its differential arranged so that the slippage of one wheel could not stall the whole vehicle as with the ordinary motor truck.

With the tractor for cross-country transport, trailers could be used to the limit of the tractive power and tractive resistance of the soil surface. Caterpillar or track-laying trailers would perhaps be practical if properly designed, and would have the same advantage in load-carrying capacity as the tractor itself. All trailers would need to be self-steering by a mechanism that would insure their following in the path described by the tractor. This is possible now with many of the trailers already on the market. As a caterpillar tractor would tend to smooth out inequalities in its passage, wheel trailers not too heavily loaded would probably be suitable on any but swampy soil.

Motor truck output is undoubtedly too great for the world's needs, except for the present temporary flurry caused by the effects of war and destruction. A development which would open a large new market for automotive vehicles should not be neglected now, even though factories are busy, for such times do not endure forever. Behind the wild activity in manufacturing circles lies the menace of shortage of food and the necessities of life. Industrial countries like America already import part of their food, while over-industrialized countries like England, Belgium and France import a larger part. The great sources of supply of grain, textile fibers, hides, tropical fats and many other necessary commodities are the agricultural countries where railroads are few and wagon roads of the poorest. The introduction of mechanical transport in those countries will not only provide a sale for the vehicles, but reduce the cost of food throughout the world by decreasing the cost of transportation, and so add to the buying power of the food producers by increasing the amount that can be paid to them for their crops.

STERLING H. BUNNELL.

Non-Corrosive Flux Wanted

A CONCERN manufacturing automobile stampings and making sheet metal bodies by means of the acetylene welding process has been having some difficulty owing to the use of diluted muriatic acid as a soldering fluid in smoothening out defects in the welding. The men's gloves are often moistened with the soldering fluid, with the result that the acid is wiped over the stamping, thus causing acid stains and gradual corrosion, which are objectionable when the time comes for enameling, as enamel will not show a luster where these stains mark the stamping. The concern is, therefore, endeavoring to secure soldering flux which will cut the metal and prepare a suitable surface for soldering, which can be guaranteed to hold the solder without flowing under a temperature of 360 deg. Fahr. Any information regarding such a flux, from manufacturers or others, will be welcomed and will be communicated to the inquirer.—Editor AUTOMOTIVE INDUSTRIES.

Thinking Behind the Mere Mechanics of Industrial Organization

Several weeks ago, the Cleveland Chamber of Commerce appointed a committee to study labor relations. The resulting report is the theme of Mr. Tipper's article this week, which stresses the necessity for treating labor problems upon the basis of mutual understanding and knowledge.

By Harry Tipper

SOME time ago the United States Chamber of Commerce, in a meeting at Atlantic City, outlined certain principles to be recognized in dealing with human relations in industry. These standards afterward were submitted to the local Chambers of Commerce for ratification, or otherwise. It was evident from the action taken by a number of these local Chambers that the plan of the convention at Atlantic City was not agreed to, when the local business groups had sufficient opportunity to think over and adjust them. Of course, this reaction from the local Chambers destroyed, to some extent, the influence of the so-called principles adopted by the general body.

The Cleveland Chamber of Commerce appointed a committee on labor relations to go into the subject thoroughly and to present the matter with any recommendations the committee felt would be proper. This committee has just brought in its report, in respect of which a good deal of comment has been visible in the daily newspapers and other general publications. No plea of hasty consideration can be charged in connection with the work of the Cleveland committee.

Ample opportunity has been given for thought and investigation and the results of this work are, therefore, of more importance than the previous attempt of the United States Chamber of Commerce to lay down standards in connection with labor relations. The importance of the committee's recommendations finally will depend, to some degree, upon the attitude which is taken by the general body of Cleveland business men in respect of the committee's recommendations. It is to be observed that the printed report deals only with the committee's statements of the matter and does not indicate any decision by the general body of the Chamber in respect to the matter. It will be interesting to follow the reaction which occurs among employers and leaders of labor in and around Cleveland now that the report has been made public and there has been some time for consideration of it.

Apart from the question of the reaction of Cleveland people toward the committee's recommendations, the suggestions contained are interesting in that they go more definitely into practice than any similar report which has been made. They admit, as a basis for operating practically, some elements which have not been admitted specifically by any previous body of business men who have investigated such matters. The committee was a representative one and the attachment of all names to the report makes it possible to determine the extent to which the members of the committee are concerned with labor relations in their own business development.

It is evident that the committee has attempted to deal with various elements in labor relations with strict impartiality and in almost every case it has indicated the position which should be taken by both parties in respect of the elements involved. For instance, in its statement as to production, it lays down the general principle that employees should not intentionally restrict individual output and should recognize the necessity for the adoption of all improved machinery and methods. That is quite usual, but the correspondent clause that employers should not intentionally restrict production to create an artificial scarcity of the product is rarely touched upon.

Of course, if the restriction of production is bad, it is just as bad for the employers to restrict as it is for the employees to do so and there are plenty of cases indicating that the practice has been indulged in on both sides. But they specifically refer to the restriction of production by employers through a reduction of piece work rates in this way: "They should not reduce piece rate prices when and because, through an employee's increased skill, they may become highly profitable to him." One of the reasons for the lack of interest among workers in increased output, and the definite decision against piece work by many labor leaders, is the bad past history due to the practice of cutting piece work rates, a practice which obtained more or less generally up to a few years ago.

This is the first time I have seen any group of business men publicly recognizing the evil influence of this practice upon production. It is in connection with the question of wages, however, that the committee makes a most radical departure from previous recommendations.

In these articles it has been stated that the supposed law of supply and demand resulted in an utterly unjust division of rewards and that the system obtained because of our lack of knowledge as to the factors which enter into production value from the human standpoint. Under this clause, the committee attempts to determine the factors which make for productive value and suggests that these should be considered in the determination of the rate of wages which can be paid to the worker. It is not likely that these suggested factors will receive the attention that may be given to the rest of the report.

It is hardly likely that their significance will be recognized and yet the great suggestion they make to the student is, the necessity for studying the value of such factors, instead of recognizing only the effect of supply and demand. In any scientific development, the

suggestion of a new basis for calculation would be considered as significant. These factors suggest a new basis for the calculation of wage rates and, in that respect, they are not only of the growing recognition of the inadequacy of present methods but another recognition of the human factors which enter into productive value. For their interest these factors are quoted in full.

"While the law of supply and demand in relation to all classes of employment must inevitably influence wage rates, in fixing rates of wages for both men and women, the following factors should be taken into consideration:

1. Cost of living.
2. Opportunity to advance standard of living.
3. Savings.
4. Loyalty.
5. Productivity—quality and quantity.
6. Initiative and individual skill.
7. Nature and hazard of the work.
8. Importance of the work performed.
9. Punctuality and steadiness.
10. Continuity of employment."

Something of the same departure in approach to the subject is indicated in the first statement under the hours of labor. This statement says that hours of work should be fixed at a point consistent with the physical well-being of the worker, providing him adequate time for leisure, rest, recreation, home life and self-development and consistent with the public's economical requirements. Very rarely has the discussion of hours of labor among groups of employers admittedly taken into consideration the necessity for leisure, rest, home life and self-development among the workers.

In fact, the instances in which this has been touched upon at all are sufficiently rare to make them conspicuous by their rarity. That a committee of the Chamber of Commerce of a large industrial city should lay these elements down as a principle to be followed in working out operating schedules is a grateful departure from the usual form of discussion. Of course, neither of the paragraphs entitled wages and hours of work indicate that consideration has been given to the effect of incentive, adequate leisure, rest and other elements of social life upon the productive capacity per hour. It is hardly likely that general statements could take this into consideration and yet it is the most important matter in connection with these two subjects.

In a previous article, we pointed out that the efficiency per man secured in some places was so much greater than the average efficiency that the men in those few shops could do as much work in six to eight hours as was accomplished in twelve to fourteen hours in the average place. Similarly, it has been proven in connection with some of the highly repetitive operations where women are employed, that fifteen minutes rest in the middle of a four-hour period of work has increased the production, although it has actually reduced the time to three and three-quarter hours. The relation between the incentives to work and to continue working, and the hours of work required has not been discussed and there is no indication that it has been recognized in these suggestions.

On the important subject of collective bargaining, the Cleveland committee takes much the same position as that adopted by the original committee of the United States Chamber with the exception that the principles involved are stated with much greater clarity and the general principle of operation is extended to cover industries where single establishments cannot be a unit of representative negotiations because of the character of the industry. In such cases, the Cleveland committee has recognized the necessity for negotiations between

groups of employers and groups of employees. One of the reasons for the failure of opponents of collective bargaining through trade unions to justify their position, has been the difficulty of applying their ideas to industries where the nature of the business precludes any form of collective bargaining except that operating through some trade organization. The specific recommendation of the committee on this point states:

"Representative negotiation is defined as that form of collective bargaining which provides for negotiation between an employer and a duly accredited representative of his employees, regarding hours, wages and all other matters properly affecting their relationship. Employees' representatives should be duly accredited, should be chosen by the employees, from among their own number, unless otherwise agreed by employer and employees, and be empowered by the employees to negotiate for them. Such negotiation should be under control of the parties immediately concerned.

"When employees of any establishment desire to do so, they should have the option of choosing, without restriction on the part of the employer, a competent advisor or advocate to meet with representatives chosen by and from among the employees in negotiations with their employer. Representatives of employees, selected by and from among their own numbers, should be assured that no discrimination will be made against them by their employer because of anything said or done in their representative capacity.

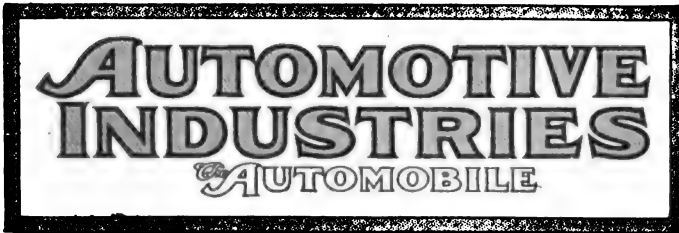
"In those industries where an establishment cannot practically be the unit of representative negotiation, the principle of representative negotiation between a group of employees is advocated. Under such conditions it is essential that the principles of this document be applied wherever practicable."

It should be noted that in addition to the modification allowed where industries cannot be represented by individual establishments as units, there is an additional clause indicating that the employees should be allowed to use a competent advisor or advocate in addition to their own representatives wherever they so desire. This is an important deviation from the platform suggested by the United States Chamber and meets one objection of the labor union to the principle of representation in the individual establishment.

Labor leaders have claimed, with some reason, that the employees' representatives were not sufficiently trained in the work of presenting their requirements to compete with the representatives of the employers and they were likely to be at a disadvantage in case of important controversy. Evidently, this clause recognizes such criticism and suggests a method of dealing with it.

The only other unusual point in connection with the committee's report is the paragraph on information and frankness. It is too bad that this paragraph was not put in the front and laid down as the fundamental principle underlying all other principles of operation.

Without information about the business, its organization, its costs and its necessities and without frankness between the employer and the employees' representatives, the other things are more or less futile and their value strictly limited. It is difficult to understand why this committee, with its careful study of the whole proposition, should have left this question until the latter part of the book, placing it after production, wages, hours, working conditions and so forth, when the actual conditions show that none of these questions can be settled without some groundwork of information.



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Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907, and The Horseless Age (semi-monthly) May, 1918.

Exports to Latin America

IN its review of the 1919 foreign trade, one of the large New York banks points out that one-eighth of all our exports went to Latin America, making it, next to Europe, the best customer of the United States. But, on the other hand, our imports from that section of the Western Hemisphere were greatly in excess of our exports—in other words, we bought from Latin America much more than we sold.

Latin America has been for some years a large factor in the exports of automotive equipment in the United States, but not the largest, at least in recent months. The market has not been slighted by the manufacturers and exporters of this country, but the reports indicate that our trade influence diminishes from north to south, the greatest volumes going to the countries nearer to the United States.

This would indicate that our manufacturers should exert greater and more compelling pressure to obtain the markets of those sections, for several reasons that might be urged. One is that unfavorable trade balances react unsatisfactorily, reducing credit and making necessary the shipments of gold to counter-

act the adverse balance. Greater sales of all products, including automotive equipment, should ensue, then, in an effort to cut down the disparity.

The Flag

AN observer, looking from a window in a New York office building, counted eleven flagpoles that were not working. There was only one other in sight, and it was adorned with a flag that waved gracefully in the mild breeze of a bright day.

"One might think our flag served only war purposes," remarked the observer. "Two years ago, looking from this window, one was thrilled with the sight of flags everywhere. There were many more than the dozen flagpoles in these days. It is a sad commentary that even the flagpoles have been taken down."

There is a strong Americanization movement in this country to-day. It began during the war, and the persons to whom it was directed often had their attention called to the flag of their adopted country. They were told many thrilling stories of the battles that had won world-wide respect for this flag. The Americanization movement apparently continues, but in many cases without the influence of the flag. What will be the effect on the enthusiasm of the foreigner who sees the flag disappear so quickly after the time of stress?

By the way! Is there one over your factory?

Ignition Troubles on Tractors

ACCORDING to an official investigation of conditions of tractor use, a large proportion of all tractor troubles during the past years, in the district covered by the investigation, were ignition troubles. This information certainly is surprising when we reflect that practically all tractors are fitted with magnetos and that we have been for years extolling the virtues of the magneto as a near-perfect piece of mechanism. Of course, even if most of the trouble with tractors is ignition trouble or magneto trouble, that does not definitely condemn the magneto as made for tractors to-day—the fault may be with the farmer.

It is true that manufacturers are endeavoring to make their magnetos dust- and water-proof, and in this they have evidently met with a considerable degree of success. But it is to be doubted whether a magneto can survive continued exposure to the elements, especially in winter. It is well to build these machines with a view to making them capable of standing up under the worst conditions, yet, at the same time, the operator will do well not to let conditions reach their worst.

Magnetos are used extensively on motor trucks and in that service are evidently giving every satisfaction. The trouble with them on tractors, therefore, would seem to be due in some way to differences in the operating conditions. There is, however, one other factor to be considered, and that is that certain makes of magnetos have been prominent in the trac-

tor field while others have predominated in the truck field.

Undoubtedly the magneto on a tractor is somewhat more exposed than one on a truck. Most of the newer tractor models have their engine compartments open at the sides and below. The tractor is habitually left out in the field overnight, exposed to the dew or rain, whereas the truck is generally put under shelter. Then there is the vibration, which in a tractor is of a peculiar short period order which may well have the effect of demagnetizing the magneto. Other demagnetizing influences are the proximity of the cast-iron crankcase to the magnet poles, tending to short-circuit the magneto, and the greater heat always associated with a heavily loaded tractor engine, especially if burning kerosene.

Unfortunately, we are left in the dark as to the exact nature of the ignition trouble of which the tractor owners complain. The farmer can hardly be expected to analyze the trouble beyond locating it in the magneto. It may be caused by loss of magnetism or it may be due to faulty interrupters, condensers or distributors. The interrupters formerly were always provided with platinum points and it is possible that, since the Russian source of platinum was cut off and this metal became exceedingly scarce, substitutes have been used for contact points which do not have the endurance of the standard platinum-iridium alloy.

As there are almost no limitations on weight and the operating speeds are low, the tractor ignition problem should not present serious difficulties. But reliable ignition is absolutely essential to the success of the tractor, and tractor manufacturers and magneto makers should co-operate in the search for and elimination of the causes of trouble.

There Is a Personnel Problem

THE amount of publicity given in recent months to every form of labor experiment and to industrial relations in general might lead to the conclusion that American employers as a whole are realizing the full extent of their personnel problems and are striving definitely to meet them. A questionnaire returned to a large government department by some four thousand American employers, however, indicates an entirely different conclusion.

Many employers, although thoroughly realizing their labor troubles seem to be making no constructive effort to meet them; in fact, the percentage who showed a positive effort in that direction were so few that they could be counted on one's fingers. The outstanding feature of the replies was the apparent failure of all but about 1 per cent of the firms to see their industrial relations in perspective.

One question, for instance, was this: "State fully any difficulty with labor which you may have had during this period and the manner of settlement." The questionnaire referred to the war work of the firms, but the reports were filed about eight months after the war was over. Here are a few typical replies:

"Men were continually asking for advances and we avoided any trouble whatever by giving them what they asked."

"Numerous strikes. Settled by paying their demands."

"There were constant demands for increases. These demands were granted either wholly or in part."

"We experienced no difficulty whatever with labor. We kept our employees contented by constantly increasing their wages."

"Number of demands for increased wages. Granted in each case."

Taking into consideration the fact that during the war production was the thing of paramount importance, such replies still indicate a failure on the part of most employers to grasp the real perplexities and difficulties of the problem. The mere increasing of wages, although it settled the immediate difficulty, offers no solution whatever to the ultimate problem. The fact that such demands do constantly recur would seem to indicate that the mere granting of them only puts off the day of reckoning a little longer. The very direct relationship between high wages and high prices is apparent.

"Settled by paying their demands," reads one reply. The trouble was, of course, no more "settled" by meeting the wage increase demanded than by failing to meet it. The solution was clearly a temporary one. Allowing for the fact that such temporary solutions were necessary because of war needs, and that they may yet be necessary because of competitive production, there is little excuse for the belief that no other solution ever will be necessary.

Bearing in mind that these reports were written eight months after the war, it is astonishing to find employers writing "Settled by granting their demands" without any qualifying explanation to indicate their realization of the fact that such action did not really settle the problem at all.

The fact that more constructive methods of meeting the problem cannot be established except by a gradual process through a long period of study, effort and adjustment is additional reason for starting the good work at once. The employer who can meet his industrial relations problem in such a way as to satisfy present production needs and at the same time keep sight of the problem in perspective is on the way toward an ultimate solution. But the first step toward solution is understanding.

EUROPEAN, and particularly English, demands for low-priced light cars may find reflection in the American home market. But in determining the possibilities of such types in this country, the factors of roadways and density of population, taking the country as a whole, must be considered before predicting that the United States might become a great field for these machines.

THE labor turnover in representative automotive plants of the City of Detroit has been running about 20 per cent for some months past, while that of similar representative plants in the New Britain, Conn., district has been only about 14 or 15 per cent. A superficial survey is not sufficient basis for an interpretation of these facts. The facts themselves, however, indicate that definite reasons are present.

Larchmont Motors Joins Makers' Ranks

**Will Build Medium Priced Car
in Newark (N.J.) District—
May Produce This Year**

NEW YORK, April 5—Walter H. Schimpf, Eastern district manager for the truck department of the Paige Motor Car Co., has organized the Larchmont Motors Corp., a \$5,000,000 Delaware company, which will manufacture the Larchmont car and a truck which has not yet been named. The factory will be located in the vicinity of Newark. Schimpf retired from the Paige service Saturday.

The new company's energies will be directed at first toward production of the Larchmont car, of which it is estimated 12,000 will be manufactured in 1921. With arrangements made for completion of a temporary factory building, July 1, it is expected that some cars will be produced this year, but no attempt has been made to estimate the number. Early next year production of a truck in $\frac{3}{4}$ - and 1 $\frac{1}{2}$ -ton models will start.

The Larchmont car will be brought out in two basic models, one for domestic and one for export trade. In the domestic line there will be a sport car on a 128-in. wheelbase, selling for about \$2,600, and three models on a 120-in. wheelbase, a 5-passenger touring car selling for \$1,850, a 5-passenger sedan for \$2,850, and a 7-passenger sedan for \$3,450. These cars will have a 6-cylinder engine. The export type, which will have a 4-cylinder power plant, will be brought out in the sport type and will sell for about \$1,700.

At the outset the Larchmont will be an assembled product, using the Beaver engine on the 6-cylinder model, the Supreme on the 4-cylinder, Covert gear-set and Columbia rear axle. The factory will be so designed that all or most of the units in the car may be built there.

The temporary factory building will have 26,000 sq. ft. of floor space and when the permanent building is completed—the latter to have 400,000 sq. ft.—will be used for storage purposes.

Enlists Well Known Officials

In association with Schimpf, who will be president of the company, Joseph Anglada, well known as a consulting engineer in the manufacture of automobile parts, will be vice-president in charge of engineering, and George O. Starr will be assistant to the president. The original financing arrangement calls for 20,000 share of preferred stock, aggregating \$2,000,000, and 30,000 shares of common stock rated at \$3,000,000.

Schimpf first became identified with the automobile business in 1899, when he directed plant installation operations for the Mobile Company of America at Tarrytown, N. Y. Later he covered the entire country as a sales representative of this corporation. A few years later he was associated with the sale of the White Steamer, Winton and Stanley in the ter-

ritory centered at Denver, and still later did road work for the Cadillac in Colorado, Wyoming, New Mexico and Utah.

In 1905 he joined the Oldsmobile in wholesale work operating from the Mississippi to the Pacific Coast. The same year he joined the production forces of the Stoddard-Dayton. For several years Schimpf was a consulting engineer in Chicago, and early in the war joined the inspection staff of the Dayton-Wright Aircraft Corporation. For a short period before joining the Paige merchandising organization he was chief engineer of the Sunderman Corporation in Detroit. He was with the Paige a year and a half.

Westinghouse Merger Declared Operative

NEW YORK, April 2—The plan for the merger of Westinghouse, Church, Kerr & Co., Inc., and Dwight P. Robinson & Co., Inc., recently submitted for the approval of the stockholders of these companies, has been declared operative by the committee appointed in accordance with the plan.

At a meeting of the board of directors of Westinghouse, Church, Kerr & Co., Dwight P. Robinson was elected president of that company pending final completion of the merger and organization of the new company.

Gen. Guy E. Tripp, now chairman of the board of Westinghouse, Church, Kerr & Co., retains this position pending completion of the merger.

The Westinghouse Electric & Mfg. Co. is one of the largest stockholders of Westinghouse, Church, Kerr & Co., and the two companies have been closely identified for many years.

To avoid what has seemed a handicap in procuring business by the latter company, on account of the belief by prospective clients that if they employed it as their construction engineer, they might be expected to purchase Westinghouse Electric equipment, and also to permit the Westinghouse Electric & Mfg. Co. to withdraw from any interest in the engineering and construction business, that being a field foreign to its normal activities and its interest therein not being viewed with favor by construction engineers competing with Westinghouse, Church, Kerr & Co., it was deemed in the interest of both companies that the above association should be terminated.

To accomplish this without embarrassment to other stockholders, and to their advantage, negotiations were initiated with Dwight P. Robinson looking to a merger with Dwight P. Robinson & Co. These negotiations resulted in the plan of merger now declared operative, under which depositing stockholders will receive for their present holdings either cash or stock in the new company.

BRAZIL KILLS OFF HORSES

WASHINGTON, April 2—The market for automotive products in Brazil is likely to be improved because of enormous exports of horse hides and the consequent rapid killing off of horses.

Freeman Motors to Build in Cleveland

**New Plant to Be Started in Fall
—Will Assemble Some Cars
This Year**

CLEVELAND, April 2—Cleveland is to have another motor car and truck plant in a few months. It will be built in the western industrial section of the city by the Freeman Motor Co. of Omaha, Neb.

Officers of the Standard Bridge Co. of Omaha, which stands behind the Freeman Motor Co., some time ago looked with favor on Cleveland as an automobile center, and F. L. Freeman, general manager, was sent here to look over the city. As a result, negotiations are about closed for a site for a plant along the Belt Line Railroad, in the Berea road district.

J. H. Albrecht, chief engineer of the Freeman Co., says: "We intended to break ground at once for the new plant, but shortage in material has delayed us some time, and we have decided to postpone building the plant until September."

For the present Cleveland headquarters of the company will be in the Whitney-Power Block, Power Avenue, where space has been leased for an assembly room. The company expects to assemble 500 trucks and about 50 passenger cars in this room this year. H. O. Stonebreaker is president of the company; Paul Reiff, vice-president; George H. Reiff, secretary and treasurer, and F. L. Freeman, general manager.

CONTINENTAL AXLE ADDS UNIT

EDGERTON, WIS., April 2—The Continental Axle Co. of Edgerton, Wis., now producing about 450 truck and trailer axles a month, is starting work on a second unit of its plant, erected in the last six months. The building will be 60 x 210 ft., of brick and steel, and with equipment will cost about \$60,000. The company is also considering the advisability of erecting its own steel, gray iron and malleable foundry because of the difficulty experienced in getting its casting supply.

CASTINGS COMPANY FORMED

CANTON, OHIO, April 2—The Motor Castings Co. has been capitalized at \$500,000 as a subsidiary of the Hercules Motor Manufacturing Co. It will operate the foundry recently purchased by the Hercules company to insure a supply of grey iron castings. Its capacity is 65 tons of finished castings daily.

BROWN ADDS TWO UNITS

PHILADELPHIA, April 2—The Brown Instrument Co., manufacturer of thermometers, indicating and recording instruments, is erecting two new buildings at a cost of \$100,000. One building will be used for the manufacture of recording thermometers and the other as a research department.

French Propose Tax on All Road Users

Horse Drawn Vehicles Would
Share Cost With Cars
Under New Plan

PARIS, March 19 (*Special Correspondence*)—Recognizing that the road problem cannot be properly handled by the present government departments, the French Ministry of Public Works is endeavoring to reach an agreement with the Treasury Department for the formation of a special National Roads Office. This body, while being attached to the Ministry of Public Works, would have complete autonomy on all matters dealing with roads. Its administrative council would consist of engineers from the government roads department, and delegates from the Touring Club, the Automobile Club, and the various automobile manufacturers' associations.

One of the greatest innovations is that taxes levied on road users would be specially ear-marked for road maintenance. This has never previously been admitted by the French Government. Further, all road vehicles, whether mechanical or horse-drawn, would be taxed. The amount raised in this way will be \$34,000,000. Before the war the upkeep of French roads cost \$8,000,000 per annum. It is expected that the cost now will be \$20,000,000, thus leaving \$14,000,000 for special work and new roads.

COCHRANE CHANGES TITLE

CHICAGO, April 2—The Cochrane Manufacturing Company has increased its capitalization from \$100,000 to \$300,000 and changed its name to the Great Lakes Forge Company. It will manufacture forgings exclusively. A new plant is being erected on a site which covers 8½ acres. G. C. Hodgson is president.

VANCOUVER CARS ALL-AMERICAN

WASHINGTON, April 2—The total number of motor vehicles registered on Vancouver Island, British Columbia, on Aug. 28, 1919, was 5020, of which 200 were trucks and 110 motorcycles, the remainder being passenger vehicles according to a recent Commerce Report. About twenty of the total number were of foreign makes. The balance were of American manufacture, if those made at the Canadian factories of American firms are included.

TO MAKE CAMERON "FOUR"

NEW YORK, April 2—The Cameron Motors Corp. of New York has established a plant at Bridgeport, Conn., where they have licensed the Liberty Manufacturing Co. for the production of Cameron 4-cylinder air-cooled motors in large quantities.

Owing to the demand for small 4-cylinder motors both in this country and abroad, due primarily to the rising cost of fuel, the first size of motor into pro-



This Bates Steel Mule Opened the Roads

When the snow piled up between Syracuse and Morrisville, the Bates Steel Mule was called upon to clear the way. The 35-mile route between the two cities was cleared in two days, making a new tractor accomplishment in that vicinity.

duction in this new plant is 2½ in. by 4 in. four-cylinder, suitable for light passenger cars, delivery wagons and cultivators.

The motor is being produced complete with three-speed sliding gear transmission and plate clutch. Production of the Cameron 3 x 4½ in. six-cylinder motor is already well under way at the Shelton plant, this motor appearing first on the market in the new Parenti light car, now being built in Buffalo.

Small Tractors Find Favor on French Farms

WASHINGTON, April 2—There is a market in France for small tractors and for tractors used for plowing only, according to a report made public today by the Bureau of Foreign and Domestic Commerce, Department of Commerce. The average French farmer, states the report, has less than 15 acres. There are only 138,000 farms in France containing 100 acres or more out of a total of 5,688,000 farm units, consequently the average farm and vineyard prefers a special type of small tractor.

The French Government is taking an active interest in the introduction of tractors and has bought directly from American manufacturers some hundreds of machines for use in the devastated areas, arranging subventions whereby the individual farmers may buy tractors through local agricultural syndicates, with the Government paying a certain part of the cost price. Tractor demonstrations have consequently become common occurrences in various parts of the country. Because they are so frequently used for plowing only, plows are usually included in the sale of the tractor.

FONTAINE BODY PRICES RISE

MARTINSBURG, W. VA., April 2—Prices on Fontaine demountable truck bodies will change on April 10 to the following rates: Model F, \$700; model F, with power hoist, \$860; model FA, with power hoist, \$1,150; model FF, with power hoist, \$1,300.

No Service on Cars Sold by Profiteers

British Manufacturers Warn Public
Against Buying from
Premium Hunters

LONDON, March 11 (*Special Correspondence*)—The American Chamber of Commerce in London reports something new in motor car advertising in Great Britain, the departure being a quarter-page space in the "Times" and other leading newspapers, announcing the plans of the manufacturer members of the Motor Trade Association for black-listing profiteering middlemen.

In a well laid out advertisement with the bold heading "To stop motor profiteering," the Motor Trade Association says to the British public:

"The shortage of motors has brought about, as everybody is aware, a great deal of profiteering. Orders have been placed for cars by persons who did not require them. Taking advantage of the priority of delivery secured in this way, they have made money by selling these cars at a big premium. They have stepped in between the straightforward dealer and the genuine buyer.

"Profiteering on motor cars is in principle the same as profiteering on food or any other commodity, and is contrary to the interest of the community.

No Sales to Premium Hunters

"Strict inquiry will be made wherever there appears to be ground for suspicion. Cars will not be supplied to known premium-hunters. If you should chance to buy a car from one such, the fact will become known to the makers. Cars which have passed from one hand to another in this irregular way will be black-listed.

"The manufacturers associated in making this announcement regard the matter so seriously that they reserve the right to withdraw from such cars any guarantee or after-sale service and attention that would otherwise be given."

G. M. C. Subsidiary to Insure Cars

Exchange Corporation Will Do Business at Start with Com- pany Dealers

NEW YORK, April 2—General Motors Corp., through its subsidiary, the General Exchange Corp., is about to launch a country-wide campaign for insurance on General Motors cars or used cars of other makes sold by its dealers.

The Exchange corporation is to be an insurance company exclusively. It was incorporated in Delaware, April 10, 1919. Little has been heard of it up to this time, because officials have been arranging for its operation under the many differing requirements of the individual States. These requirements have already been met in many States, notably New York and Illinois, and agents are now busy soliciting insurance.

It was learned the company will operate along usual insurance lines, maintaining standard rate but will feature quick service on adjustments. General Motors service is to be the watchword of the company, and delays now experienced by dealers and owners will be eliminated.

Whether the business of the corporation will be extended so as to include cars sold by all dealers will be determined later. The point most emphasized is that there will be no connection between the Exchange corporation and the Acceptance corporation other than that they are General Motors subsidiaries catering exclusively to General Motors dealers. W. A. Edgar is general manager of the exchange.

BAKER TO TRIPLE OUTPUT

CLEVELAND, OHIO, April 2—Baker R. & L. Co. announces expansion of its business to allow for greater production of Baker Industrial trucks and Raulang bodies. The electric car business was sold to Rauch & Lang, Inc., of Chicopee Falls, Mass., some time ago, and the manufacturing space made available is expected to triple the truck production during this year.

CARBORUNDUM EXTENDS PLANTS

NIAGARA FALLS, April 5—The Carborundum Co. will spend approximately \$500,000 on its plant here and its furnace plants at Niagara Falls, Ont., and Shawinigan Falls, Que. A large addition to the paper and cloth plant already has been completed and another will provide for expansion of the wheel-making and kiln departments.

COVERT UNITS PROGRESS

BUFFALO, April 7—Additions to the Covert Gear plant in Lockport are progressing rapidly. The construction work will cost \$250,000. It will add 60,000 ft. to the company's floor space and will increase its capacity 40 per cent. Alwin A. Glaetzner, president of the company, ex-

pects to have machinery installed and the building operation in another month. He says the plant, when the addition is in swing, will be one of the largest of its kind in the United States. The company recently added to its contracts one with the Pierce-Arrow company of Buffalo.

Another plant completing a big addition is the Harrison Radiator Corp., owned by the General Motor corporation.

The company has purchased all the property adjacent to its plant on South Street, and is negotiating to buy the Washburn Street school from the city. It will use this land to double its present plant.

Company Forms to Build Tourist Camps

DETROIT, April 2—Great Lakes Way Club has been organized in Grand Rapids with representatives from Cadillac, Holland, Petoskey and other cities in the Michigan tourist belt, for the purpose of conducting tourists camps this summer. The company will be incorporated under the laws of Delaware with \$500,000 of preferred stock at the par value of \$25, and 20,000 shares of common stock of no par.

The company proposes to establish five camps at the start, of a construction and character in harmony with their surroundings, providing sleeping and eating accommodations for tourists. At the organization meeting the opinion was expressed that this will be the greatest touring year in Michigan history, the improved road condition and the many sightseeing trips furnishing an attraction for automobile lovers.

AIRCRAFT INSURANCE GROWS

NEW YORK, April 6—A steadily increasing demand for various forms of aircraft insurance is reported by offices writing this class of risk. The inquiry comes from all parts of the country and usually is for good-sized lines. Rates still vary somewhat and appear high when compared with other forms of risks. The fire hazard rate for dirigibles runs from 20 to 30 per cent for a six months' policy. Airplanes are being insured against fire and theft at rates averaging about 4 per cent for six months. The collision hazard ranges from 7 to 9 per cent and that for property damage is being assumed for 5 per cent.

J.V.B. ADVANCES PRICES

AKRON, April 5—J.V.B. Engine Co. will remove to a larger plant in Cleveland on April 15. The company announces an increase in the price of its motor from \$1,000 to \$1,250. This applies to both the types it makes.

LA FRANCE TRUCKS ADVANCE

ELMIRA, N. Y., April 2—List prices on all Ward La France motor chassis have been advanced as follows: Model 2B, 2½-ton, \$3,590; model 4A, 3½-ton, \$4,490, and model 5A, 5-ton, \$5,490.

Mexican Air Rights Sought by British

Mail and Passenger Lines Under Consideration—Commercial Offensive Noted

QUERETARO, MEXICO, April 5—It is planned by the Mexican Government to establish airplane mail routes throughout the country and to do away almost entirely with the present method of transporting the mails by railroads. It has not yet been fully determined whether the airplane mail service shall be done under contract or by government-owned and operated machines.

An English syndicate has submitted a proposition to perform the proposed mail-carrying and distributing service, furnishing its own airplanes and aviators, and the matter is now under consideration by Andres Garcia, postmaster general. Francisco R. Villaviciencio, Mexican consul general in London, England, who arrived in the City of Mexico on vacation recently, brought with him details of the plan of the English syndicate for establishing and maintaining mail routes in this country.

The scheme provides for three main aerial routes between the City of Mexico and Juarez, passing over Aguascalientes, Torreon and Chihuahua; between the City of Mexico and Laredo, Tamaulipas, with stops in Queretaro, San Luis Potosi and Monterey; between the City of Mexico and Tampico, passing over several cities, among them Pachuca, and between the City of Mexico and Vera Cruz.

It is believed that only 6½ hr. will be necessary to make the trip to both Juarez and Laredo from the City of Mexico. For the other two terminals, Tampico and Vera Cruz, 2½ will be enough, it is estimated. The personal fare would amount to 300 pesos to Juarez or Laredo and 150 to Tampico or Vera Cruz, passengers having the right to carry with them, free of extra charge, baggage weighing no more than 30 lb.

Planes to Carry 14 Passengers

The big English concern which is contemplating establishing such a service is ready to spend more than \$2,000,000, according to Villaviciencio, who says he is commissioned by the company to make arrangements with the Mexican Government. Planes of the very biggest type would be used, with a capacity of 14 passengers.

The tide of English trade is beginning to be felt in Mexico and a large amount of propaganda literature is being spread all over the country. One of the most important features of the English commercial offensive now being waged is that referring to the sales credit system, which enables the Mexican merchant to secure the goods he needs without paying cash for them.

British concerns are actually granting a six months' credit and are doing much in regaining this market for them. People here recall the fact that this credit system was practised before the war.

Chamber to Discuss Trucks and Roads

Atlantic City Convention to Hear of Business Impetus Through Route Lines

NEW YORK, April 5—Recognition of the important part good roads and motor truck transportation will play in the development of the country has been given by the Chamber of Commerce of the United States. Consideration of this subject has been given a conspicuous place on the program of the annual convention which will be held at Atlantic City, April 26, 27 and 28. All phases of the problem will be taken up by experts at a group meeting Wednesday afternoon, while it will be discussed in a broad way at the general meeting the morning of the same day by George M. Graham, general sales-manager of the Pierce-Arrow Co.

Graham's general subject will be "Highway Transportation," and he will consider all phases of it, from the factory to the farm. F. A. Sieberling, chairman of the highways committee of the U. S. C. of C., will preside at the group meeting. The war's development of motor transportation will be considered by Lieut. Gen. Robert L. Bullard, U. S. A., and Windsor T. White, president of the White Co., Cleveland.

The Federal Government's part in the country's highway program will be discussed by Director McDonald, of the Bureau of Public Roads, and Roy D. Chapin, of the Hudson Motor Car Co., while the state's part will be taken up by W. A. Alsdorf, chairman of the Ohio Good Roads Commission, and A. G. Batchelder, of the A. A. A.

Luke W. Duffey, chairman of the good roads committee of the Indianapolis Chamber of Commerce, will tell of the farmer's interest in motor transportation; W. J. L. Banham, general traffic manager of the Otis Elevator Co., will take it up from the viewpoint of the manufacturer, and W. F. Knowles, director of extension for New Jersey, from that of the consumer.

J. F. Witt, Dallas, Tex., will speak on regulation of highway transportation. This is a subject which is being given serious study in several states. More than half as much tonnage is now being carried on trucks as on trains. California has given control of this traffic to its Public Service Commission and Washington contemplates taking the same step.

Merchants Giving Real Support

The motor truck division of the National Automobile Chamber of Commerce reports that all manufacturers now are enthusiastic over the development of rural truck transport lines. Merchants in many cities are lending their hearty support by giving liberal shipments.

Louisville bankers are back of the Union Transportation Co., which will erect a \$100,000 truck freight terminal. Shipments of grain into that city by truck have increased the amount handled there to such an extent that it has been

necessary to provide additional elevator facilities. More than two-thirds of the hogs now shipped to Indianapolis are carried by truck, some shipments coming as far as 80 miles. The past winter demonstrated that truck lines often can remain in operation when snow paralyzes traffic on steam and electric roads. The post-office department has awarded mail contracts to companies operating out of Pocatello, Idaho, and Lerton, Okla.

F. W. Fenn, manager of the motor truck division of the N. A. C. C., will start on April 11 for a tour of truck factories to inform the executives and sales-managers of developments and opportunities in that field. Among the places he will visit will be Syracuse, Rochester, Buffalo, Detroit, Lansing, Pontiac, Alma, Grand Rapids and Chicago before going into Wisconsin.

Design Compressor for Heavy Pneumatics

CLEVELAND, April 2—The United States Air Compressor Co. has removed to its new factory in Harvard Avenue. The plant is equipped with every modern device to speed production. An example is the running-in stand which laps in 30 compressors at a time.

Demand for high pressure air in greater volume, caused by the increasing use of pneumatic tires on trucks, has caused tire dealers and garage men some anxiety and the Giant two stage air compressor manufactured by the United States company is designed to meet this need.

The company claims for its compressors new features among which is their patented automatic air release and unloading device for A. C. motors, which eliminates any chances of burning out the motor through overloading. They also make the Giant Usaco in portable form, as it is much easier, in some cases, to take the compressor to the truck than it is to bring the truck within reach of the stationary compressor.

VALVE ROTATOR UNDER TEST

MILWAUKEE, April 2—Exhaustive tests are being made in Milwaukee and Waukesha, Wis., of a new device called a valve rotator, invented by W. G. Buck of Fremont, Neb., and being developed by H. L. Horning, president and chief engineer of the Waukesha Motor Co. The invention is based on the theory that a poppet valve should rotate on its seat. The device is comparatively simple and robust. The valve-stem fits into a sleeve, from the outside of which extends a pin which fits into a spiral slot in a second sleeve. When the cam raises the valve, the pin rotates it through a small angle. A ball-bearing lock at the bottom of the stem holds it in place on the down stroke so that at each operation the valve remains where the rotating pin leaves it at the top of the stroke. The device is not yet in production, but its practicability is said to have been demonstrated and the establishment of a factory is being considered.

British Commercial Aviation Extends

New Aerodrome Shows Value of Geographical and Meteorological Advantages

WASHINGTON, April 5—Development of commercial aviation in England by the Handley Page Co. is outlined in a bulletin sent out by the Air Service. It shows that from May 1, 1919, to Feb. 26, last, 4170 passengers had been carried as well as 47,776 lb. of freight, while the mileage covered was 80,818. Almost all the freight was carried on the air route from London to Paris and Brussels, and nearly 1000 passengers were transported across the channel. The bulletin says:

"The acceleration of the delivery of freight and the conveyance of passengers, which has resulted since the Handley Page aeroplanes have been utilizing Cricklewood Aerodrome, as the departure and arrival station for machines flying on the Continental Air Services, illustrates the extreme value of an aerodrome with geographical and meteorological advantages.

"Pilots flying to and from Paris or Brussels by entering London from the North can now avoid the Surrey Hills, which in the past have often caused delay, when mist or low clouds are about and bad visibility has made them difficult to cross. Its high position renders Cricklewood Aerodrome comparatively free from mist, and it is often possible for machines to depart or land when lower districts are enveloped in fog.

"The waters of the 'Welsh Harp' and the railway line are unmistakable landmarks for aviators nearing Cricklewood, and no time is lost in endeavoring to locate the aerodrome.

"Now that the Handley Page aeroplanes arrive at Cricklewood Aerodrome from the Continent, it is possible to link up the railway with the London-Paris air route, so that freight continues its journey with the shortest possible delay. The Midland Railway Station being only a few hundred yards from the aerodrome, cargo which has left the Continent at mid-day arrives at Cricklewood at 3 p. m., is quickly passed through the Customs Offices, situated on the aerodrome, and the same evening is being carried North an express for delivery in the Midlands."

PHILADELPHIA, April 5—Handley Page, noted British air engineer and inventor of the Handley Page bombing machine, inspected the Philadelphia Navy Yard, visiting the Government aircraft factory. Page expressed the belief that it will not be necessary for the Government to subsidize aircraft development in order to attain a point where aviation will be of commercial importance.

GOULD ENLARGES PLANT

BUFFALO, N. Y., April 2—The Gould Storage Battery Co. is enlarging the capacity of its plant at Depew by the purchase of an adjoining building for the use of the storage battery department.

Kansas City Banks Curtail Car Loans

Intimate Loan Companies Should Discriminate According to Needs of Buyers

KANSAS CITY, April 5—Banks are beginning to hold down loan companies financing motor car purchases. Some loan men are inclined to charge the bankers with taking advantage of the Federal reserve orders on curtailing loans, to raise the rate; but the earnestness of the Federal reserve agents in urging curtailment, requires some vigorous resistance to borrowers by bankers.

The resistance, however, has more than one unpleasant effect. It not only hampers the securing of money for car purchases but it spreads the impression that cars are a luxury, and unnecessary at this time. Bankers admit that they cannot always discriminate; and they intimate that the loan companies perhaps don't always try to discriminate between the prospect who needs a car and can well afford to buy it and the prospect who is stretching his resources to the breaking point to buy a car.

The motor car industry, however—in this territory—is no worse off than other industries, in this respect. Restrictions on loans, and increasing rates, seem to hit the careless financiers as well as those who guard their resources carefully. Probably thousands of people in Kansas City are having to forego purchases of phonographs, clothing, household furniture, as well as motor cars, because banks refuse to renew their notes or to lend them more money except at higher rates.

The banks are also exerting pressure to get Liberty Bonds now securing notes back into owners' hands, regardless of the purposes for which the money was borrowed—the Federal Reserve Bank hoping to encourage thrift through the semi-annual clipping of the coupons by bond owners.

THOMART TO BUILD TRUCK

AKRON, April 5—The Thomart Motor Co., organized by a group of Akron business men, has purchased the plant of the Seneca Chain Co. and will specialize in the manufacture of a light $\frac{3}{4}$ -ton truck, known as the Thomart, with a speed placed at from 30 to 35 miles per hour. The Thomart company is named after its president, William G. Thompson, and its vice-president, James L. Stewart.

DETROIT DEALERS SHY ON CARS

DETROIT, April 5—Dealers in the Detroit zone are finding themselves hard hit by the arrival of spring for the reason that manufacturers are sending the greater part of their cars to western dealers, who up to this time have been held back on their allotments on account of the freight car shortage. With no cars for deliveries and the roads tied up, preventing drive-aways in that direction, local dealers and those in the territory

close to Detroit have been given practically all of the cars that have been turned out. The result is that practically all of them have had their allotments, and in some cases have been given more than their quota for the simple reason that it was impossible to deliver at long distances, and factories had no space for storing cars. With the good weather of the last week drive-aways to western points have started and the greater part of factory production is headed in that direction. Few of the dealers in Detroit are promising deliveries under three or four months, and some of them are unable to guarantee delivery before the late fall.

Milburn Wagon Turns Truck Distributer

CINCINNATI, April 3—Further evidence of the ascendancy of the motor truck in the field of transportation is seen in the announcement of the United States Motor Truck Co. that its product will be distributed in Ohio, Michigan and Illinois by the famous old Milburn Wagon Co. of Toledo.

The name of the Milburn wagon has been known throughout the country for 75 years and has been a household word with farmers for three generations. It always has been symbolic of quality and fair dealing. The fact that this company has gone into the truck distribution field shows that it believes the day of the horse-drawn wagon is rapidly waning.

"Vehicle manufacturers who 'think things through' have realized already that the motor truck has supplanted the heavy horse-drawn wagon for use outside the farm," said a statement by the Milburn Co. "To-day the farmer is thinking how he can make use of motor truck transportation."

A. C. LAST PLANT GROWS

SHEBOYGAN, WIS., April 2—The A. C. Last Trimming Co., Sheboygan, Wis., manufacturer of motor car tops, upholstery, cushions, etc., has outgrown its factory and is breaking ground for a new two-story plant, 45 x 100 ft., at South Fifteenth Street and Georgia Avenue. It will continue to do jobbing work for garages and private owners.

DETROIT BODY ADDS UNIT

CORUNNA, MICH., April 2—Detroit Weatherproof Body Co., which recently moved part of its plant here from Pontiac, has let a contract for the construction of an addition to plant A, which will connect it with plant B. The improvement will cost about \$40,000.

GOODRICH LOSES SUIT

NEWARK, N. J., April 5—Auto Tire Exchange, Inc., has been awarded a judgment in Federal district court against the B. F. Goodrich Co. for failure to deliver automobile tires for which a contract had been signed. The amount claimed was \$36,634.

Coast to Feature Truck Development

Caravan Run by Portland Ad Club to Precede New Route Openings

PORTLAND, ORE., April 2—The Portland Ad Club has aroused national interest in its plan for a motor caravan run over the Pacific highway from Portland to Stockton, Cal., where the Pacific Coast Advertising Clubs' Association will hold a convention May 25. The War Department has just announced that a division from the Motor Transport Corps will enter the caravan, which makes the run one of much importance from a military standpoint.

In addition to this, George Bellis, manager of the Northwest branch of the Goodyear Tire & Rubber Co., just established in Portland, says his company will enter one of the famous Akron to Boston trucks in the caravan with the first load of rubber for the new Goodyear factory at Los Angeles. A cargo of rubber for the Goodyear company is due to arrive in Portland from Sumatra in May, but if it doesn't arrive in time for the caravan run enough for this first truck load will be taken from an Akron-bound shipment due in Seattle a little earlier.

Bellis made another statement of much interest not only to the Northwest but to the whole Pacific Coast, and, even more, to the whole motor truck industry. This was that the Goodyear company plans to establish in the very near future three long-distance truck runs on the coast, modeled after the Akron to Boston service. Pneumatic-tired trucks will be used.

One of these projected runs will be over the Pacific Highway from Los Angeles to Portland and Seattle. When established this will be the longest truck run ever attempted on a regular routing. Another will be across the Cascade Mountains via the Sunset Highway to Spokane. And the third will be from Spokane to Lewiston, Idaho.

The project is still in a tentative shape, but Bellis says will almost certainly be put into effect on a regular schedule with completion of the company's Los Angeles factory. Only company freight will be hauled, but the big purpose of the proposed service is to demonstrate to what extent the motor truck with pneumatic tire equipment can hope to compete with the railroads on long distance hauls.

LAY ROAD DAMAGE TO TRUCKS

DETROIT, April 2—Complaints have been received that trucks hauling heavy freight between Detroit and Toledo are ruining that portion of the Dixie Highway. Highway commissioners have taken up the complaints and will seek a legal remedy to put an end to it. Heavy trucks, weighing as high as 5 tons and loaded with 10 or 12 tons of freight, are said to have been pulled over the road, tearing it up along the entire route.

Embargoes Raised to Aid Indiana Trade

Freight Congestion Lessened by Railroad Move—L. C. L. Shipments Now Permitted

INDIANAPOLIS, April 2—Indianapolis motor car manufacturers are being relieved, according to the statement of railroad officials, by the lifting of embargoes on shipments to and from Indianapolis. It is predicted that all embargoes on freight will be lifted within the next two weeks. •

This will relieve a situation which has tended to decrease the production and make deliveries difficult by Indianapolis motor car factories. For some time it has been impossible to get shipments out of Indianapolis because of the lack of automobile freight cars.

For several weeks there has been an embargo on trap and ferry cars on The Big Four and Pennsylvania lines. Trap and ferry cars are used in hauling freight from factory warehouses to freight houses. The Big Four has already lifted this embargo and the Pennsylvania is soon to follow. Restrictions on less than car load lots into the city have been lifted.

There is yet considerable congestion on the Eastern lines, not fully recovered from recent storms, which is having its effect on the Indianapolis shipping situation. Local motor car manufacturers report a delay in the receipt of shipments of materials coming to Indianapolis. There has also been a shortage of freight handlers in local freight yards which has tended to aggravate the situation.

FRANKLIN BUYS CITY BLOCK

SYRACUSE, April 6—An entire block almost in the center of the city has been purchased by the H. H. Franklin Mfg. Co. for an extension of its plant. The property acquired is bounded by Gifford, South Geddes and Seymour streets and South Wilbur Avenue, and covers three acres. The transaction is one of the largest of its kind in the city's industrial history, but the purchase price has not been disclosed. Much of the land taken over will be used for storage purposes.

The Franklin company announces that it now is turning out cars at the rate of 60 daily and that the production for next year will not be less than 25,000. March was the biggest month in the company's history, with 1542 cars shipped and 1428 assembled.

FOREIGN TRADE NOTES

NEW YORK, April 5—Eight offices on the east coast of South America will be opened by the United States Shipping Board in the near future, while the agencies in Rio de Janeiro and Buenos Aires will be opened this month. New sources of information for American automotive manufacturers will be available when the branches are in operation.

American exporters have learned that triple custom dues and the exchange pen-

alty have more than doubled the price of American tractors in France. But the French makers cannot supply the demand, and particularly in the North the tractors are absolutely essential. The Minister for Agriculture reduced to 25 per cent the subsidy formerly granted to agricultural societies for the purchase of French tractors, and to 10 per cent the former subsidy of 50 per cent for imported tractors. In spite of this the market can be developed, and those who seize it now will be able to hold it later.

In view of the importance of the agricultural production of Algeria and the present deficiency in transportation, it is reported that the motor tractor and motor truck demand is very great. It should be noted that there is a regular service of shipping from the United States to Algerian ports.

Willys Takes Over Former Allen Plant

FOSTORIA, OHIO, April 3—The former plant of the Allen Motor Co. at Fostoria, Ohio, has been taken over by the Willys Corp., and will be operated in the production of farm lighting plants. The Chamber of Commerce at Fostoria as an inducement to the Willys Corporation agreed to pave the street leading to the property and to operate a street car line to the plant. The chamber also guaranteed to furnish houses sufficient to care for the many new residents who will be brought to Fostoria.

The Allen plant and site includes 55 acres upon which the Willys corporation immediately will begin the erection of large factory additions. Pending construction of the additions, the present factory buildings will be equipped and operations will begin in them as quickly as possible. Negotiations for the transfer of the property and all details in connection therewith were concluded at a dinner given by the Fostoria Chamber of Commerce at which officials of the Electric Auto Lite Co., the Willys-Overland Co., and the Willys Corporation were guests.

ACE SALESROOMS OPENED

NEW YORK, April 6—The airplane has made its formal debut in Automobile Row and has been warmly welcomed by its older neighbors. The headquarters are at 240 West Fifty-ninth Street, the distributors Club Motors, Inc., and the machine a snappy little Ace made by Horace Keane, Inc., of this city. One of the Aces recently made a successful landing in the principal street at Oakland, Cal.

The Ace weighs only 600 lb. and has a wing spread of 25 ft. With a landing speed of 30 miles an hour a run of only 60 ft. is required to bring it to a full stop.

CARS SUPERSEDE WINDMILLS

WAUSEON, OHIO—The Automotive Body Co. has purchased the Red King windmill factory with three acres of land adjoining and is getting the plant in condition to begin operations at once.

Chevrolet to Extend Northwest Business

Assembling Plant in Portland to Be Part of Building Operation

PORTLAND, ORE., April 2—Chevrolet Motor Co. of California has selected Portland as Chevrolet distributing headquarters for the entire Pacific Northwest territory, and as soon as leases and building arrangements can be closed the company will erect here a building with 60,000 ft. of floor space, to cost \$200,000.

Within five years at most, according to plans, Chevrolet will build an assembling plant in Portland. The territory is expected to absorb 25,000 Chevrolet cars a year in the next five years.

In addition, the company will build or acquire a large wholesale warehouse in Seattle, and will add another unit to the Chevrolet factory at Oakland, Cal., costing \$1,500,000. The company has just completed plans to build a four-story retail building in Oakland, at cost of \$250,000 for building and ground, and a retail building, to cost \$150,000, will be erected in Los Angeles.

The Chevrolet company already has a six-story warehouse of 40,000 sq. ft. capacity in Portland. This will be retained in addition to the projected new building.

WON'T RESTRAIN BODY UNION

NEW YORK, April 5—Justice Gavan has denied an application for an injunction to restrain the officers of the United Automobile, Aircraft and Vehicle Workers Union of America from interfering with the business of their employers and non-union workers by picketing in connection with their strike for higher wages and a 44-hour week. The court ruled that nothing illegal had been proved. The restraining order was asked by Locke & Co. in behalf of themselves and 20 other members of the Automobile Body Manufacturers and Allied Trades of New York. Efforts of the Bureau of Mediation and Arbitration of the State Labor Department to bring about a settlement have been futile in about half the shops.

MONTANA WANTS OIL TRUCKS

BUTTE, MONT., April 2—Recent oil discoveries in the Roundup and Lewiston fields in Montana have developed a demand for trucks. To meet the demand many trucks adaptable for use in the oil fields have been shipped into Montana from Texas.

ADDS NEW ENGINE LINES

NEW YORK, April 5—The Parr-Loichot Engine Corp., 380 Canal Street, New York, has added to the line of marine engines which are represented in the New York territory by this company, the two-cycle and four-cycle Knox marine engines built by the Camden Anchor-Rockland Machine Co. of Camden, Me.

Diesel Type Gains Favor in England

Olympia Motor Boat and Engine Exhibit Shows New Manu- facturing Tendency

LONDON, March 18 (*Special Correspondence*)—Out of a total of 146 exhibitors at the International Motor Boat and Marine and Stationary Engine Show now open at Olympia, 28 firms are exhibiting craft of types ranging from rowboats with petrol motors and canoes with electric sets to seagoing cruisers up to 60 ft. in length. But the majority—50 in all—show engines for marine and stationary work; of these makes 32 burn gasoline, kerosene, or both, while 14 are of the semi-Diesel pattern using crude oil, one is a full Diesel type and three utilize either producer or coal gas.

In addition 10 firms stage house and ships' lighting sets with gasoline and kerosene engines (two of these are American outfits, Delco and Lalley); outboard motors are represented on seven stands (5 American, 1 British and 1 Swedish), while marine and marine engineering equipment appears on 63 exhibits.

The exhibition cannot be looked upon otherwise than a success from the stallholders' point of view. There have been no great crowds of the sightseeing public—as at the Motor Car Show—but the visitors have, most of them, serious intent as prospective buyers. From the promoters' standpoint—the responsible body is the Society of Motor Manufacturers and Traders working in collaboration with marine engineering associations—the exhibition will only just avoid showing financial loss, though the individual members concerned should reap benefit from business done. Generally, reports are favorable concerning orders and inquiries.

America is fairly well represented among the gasoline and kerosene marine engine exhibits. Among the makes present on one or other of the stands are Kermath, Peerless, Sterling, Wisconsin, Evinrude, Koban and Buffalo. French engines appear in one instance only, the Chapuis-Dornier, though these motors have nothing about them to signify departure from automobile practice.

New England Firms Exhibit

British makers are, as might be expected, largely in the majority and, besides such well known names as Wolseley, Thornycroft, Beardmore, Brooke, Parsons and Green, there are a great many which have hitherto had merely national, or even only local, fame among motor boat engineers.

The outstanding feature of the show is the evidence it accords of the largely increased number of British engineering firms who have taken up the manufacture of semi-Diesel engines for marine and stationary work. Such well known concerns as Sir William Beardmore & Co., Babcock & Wilcox, Vickers, Gardners, Allen Sons & Co. and Robeys among others, are devoting considerable energy

developing this type of power plant. Beardmore's in particular are out for a world-wide trade, with a range of plants from the single cylinder 10 hp. engine to a 500 hp. 4-cylinder capable of extension in cylinder units or running as one of a twin or tandem.

Babcock & Wilcox at present are agents only for the Munktell engines, but are organizing to produce this design in their Glasgow plant. Vickers have absorbed a British concern (Petters, Ltd.) with a name and connection for crude oil engines and are planning to enlarge this side on a big scale.

Few automobile firms in Great Britain take any interest—commercially—in marine motors. Wolseley and Thornycroft are notable exceptions, but then the latter were originally marine engineers and shipbuilders. Wolseley have a range of modified car type motors varying from their light car model of 10 hp. with 4 cylinders to a 6-cylinder of 4¼ x 5¼-in. bore and stroke. The latter is fitted with the Elma-Vickers reversing gear, a bevel type operated by magnetic clutches, which, as a four-speed set for automobiles, it was at one time last year rumored would be standardized on Wolseley touring cars.

Ohio Body & Blower Moves Into New Plant

CLEVELAND, April 3—The Ohio Body & Blower Co. last week moved into its new five-story plant on the west side, and has booked orders for \$1,000,000 worth of new bodies, according to H. H. Lind, vice-president and treasurer. The roof is being put on another five story unit containing 90,000 feet of floor space, and it will be ready for occupancy by June or July. This plant will be used for the manufacture of closed automobile bodies. Open car motor bodies will be made in the factory just completed. This unit will enable an increased production of open bodies to fifty or sixty a day, while this number will be augmented by eight to ten a day when the closed body shop gets into operation.

OSHKOSH TRUCK TO BUILD

OSHKOSH, WIS., April 2—Plans for the new manufacturing plant to be erected by the Oshkosh (Wis.) Motor Truck Co. this year are being prepared by Architects Auler & Jensen of Oshkosh, and will be ready for bidders about April 3. The first unit will be 80 x 312 ft., with an office, 40 x 64 ft., and a boiler house and transformer house. The investment in buildings and machinery will be about \$150,000. The company has been in business about four years and hopes to build 500 trucks in 1920.

HOOVEN IN NEW FACTORY

CHICAGO, April 2—The Hooven Radiator Co. is now occupying its large new factory building on Northwestern Avenue. It is turning out 1000 radiators a day and has the capacity for double that number.

Truck Lines to Use Big Freight Depots

Rural Motor Truck Terminals Planned—Will Handle 150 Tons Daily

MINNEAPOLIS, April 2—Construction of a huge motor truck terminal and transfer station in Minneapolis, where a fleet of 100 express trucks may be loaded with commodities at night for shipment early the following morning, will be started soon by the Rural Motor Truck Terminals, Inc.

This company, which already operates a truck terminal handling several hundred tons of package express daily, will have 60 trucks in operation on routes radiating from all directions soon, handling 150 tons or 300,000 lb. daily, equal to the capacity of five railroad express cars.

Already the rural lines run north to Duluth, west to Little Falls, south to Mankato and Rochester and east to Eau Claire, Chippewa Falls and New Richmond, Wis.

The terminal company, of which Senator P. G. Callahan is superintendent, will concern itself strictly with the operation of the terminals in Minneapolis and St. Paul, and with the transfer of express from these two points. The company will furnish a place for the transfer of freight for which the independent truck lines operating over regular routes may load and unload their express or transfer it to other lines. These independent companies pay a small fee for the privilege of using the terminal just as a number of railroads pay rentals for the use of a union depot.

The company, which was formed last November, has already published its own freight and tariff classifications, and these published uniform rates apply on all the traffic handled by the company and associate lines.

PULLMANS GET ORDER

CHICAGO, April 2—The Pullman Co. announces that additional orders for automobile bodies have been received from the Packard Co. In order to take care of this kind of business the Pullman has under way additions which will cost nearly \$3,000,000.

WEHR STEEL BUYS ANDREWS

MILWAUKEE, April 2—The Wehr Steel Co., Milwaukee, has acquired the plant and business of the Andrews Motor Mfg. Co., 834 Muskego Avenue, Milwaukee, manufacturing outboard engines for rowboats and canoes and conducting a jobbing machine shop business. No information concerning the disposition to be made of the Andrews shops has been divulged. The Wehr company, which conducts one of the largest steel and electric steel foundries in the Middle West, which is being enlarged by a 60-ft. addition to the cleaning room, equipped with a new Milwaukee 10-ton electric crane and new sand blast machinery.

"Look Out for Reds" Warning of Gompers

**Tells Business Editors Employers
Must Choose Between Feder-
ation and Radicals**

NEW YORK, April 6—Labor's outlook upon the problems which confront industry was sketched by Samuel Gompers at a luncheon to-day of more than 100 editors of papers which are members of the New York Business Publishers' Association.

"I do not expect the thoughts I have expressed to find a full reflex in your minds," said the president of the American Federation of Labor as he brought his address to a close, "but I do submit that they are worthy of your thoughtful consideration."

The admonition of the aged chieftain of the labor movement scarcely was needed, for it was evident that his hearers already were thinking as he came to the climax of his address with these words:

"If employers make the work of our movement more difficult and make us impotent to be of service to our fellows, rest assured our tenure of influence soon will end and they will have to confront a new movement in which Americanism, patriotism and progress will have no part.

"We stand as the bulwark of Americanism and it is a question of choice whether the place we now fill shall be taken over by those who have no respect for labor, for the employer, for the public or for the home. We are conscious of our power, but we are even more conscious of our responsibility."

Before uttering what he and his hearers regarded as the most impressive sentences of his address, Mr. Gompers outlined the aspirations of labor "for a better life, a better time and better things." He declared it was their determination to give their children greater advantages than they had in childhood, but he decried "the attempt to take too many children out of industry and put them into professions which are regarded as of so much higher a standard than the real productive work of the world." He asserted that the dignity of labor is too little understood and that boys and girls should be taught real industrial service.

More Wages, More Production

Mr. Gompers, whose scalp is being sought by the ultra-radicals on the ground that he is a conservative, declared the A. F. of L. represents 25 per cent of the American people. He cited as its first demand a minimum wage compatible with the American standard, although not of necessity unalterable. He declared that the higher the standard of living for the great masses the faster wheels of industry would revolve.

"Any employer who can't afford to pay a minimum wage conforming to the American standard should get out of business and make way for some one who can," he said.

"A better day to-day than yesterday and a better day to-morrow than to-day," he cited as the ideal of labor.

Taking up the question of hours, he said history had shown that a normal eight-hour day is of material advantage. If there is under production it is due more to bad management than to the workers themselves, he contended.

"Labor will insist upon the right to organize both skilled and unskilled workers and upon the principle of collective bargaining," he asserted, adding that "nothing is so potent to prevent strikes as a well organized labor movement and well organized employers.

"The labor movement does not aspire," he said, "to dominating absolutism in industry, but it must have a voice in fixing the conditions under which its labor power shall be sold."

Flanking Mr. Gompers at the speakers' table were Frank Morrison, secretary of the Federation, and Hugh Frayne, organizer for New York State.

Goodyear Rim Plant to Make 10,000 a Day

AKRON, OHIO, April 2—Goodyear Tire & Rubber Co. has begun construction of a rim plant to be housed in a one-story brick and steel structure, 250 x 660 ft., which will have a capacity of 10,000 rims a day. The plant will employ 500 workmen. Contracts for the buildings and machinery were let some time ago, but weather conditions delayed construction. Steel and a large part of the rim-making machinery is on the ground.

Goodyear has acquired 200 acres along the Baltimore & Ohio railroad, which will be used in the manufacture of rims and wheels, for storage warehouse, and for housing. The present rim plant will be moved into the new plant about July 1. Cantonment buildings similar to those used by the Government will be erected to house 1000 employees, and will be ready for occupancy about the middle of May. Bus lines between the various body plants will start May 1.

FLEXIBLE COUPLING ON MARKET

NEW YORK, April 5—A flexible coupling of unique design known as the Karge coupling has been placed on the market by the Karge-Baker Corp. of Phoenix, N. Y. This coupling designed to eliminate friction losses in power lines and to insure correct alignment of shafts has been used very successfully in connection with engines carrying heavy loads. The Karge coupling is a friction coil coupling which will adjust itself to shaft misalignment, without power loss, eliminate shock and vibration strains and allow each section of the shaft to run freely on its bearings.

FORD CONTRACTS RESTRAINED

AUSTIN, TEX., April 3—Judgment has been entered in the district court perpetually enjoining the Ford Co. from making contracts for sale of its cars in Texas under restricted territory agreements.

Piece Work Divides British Labor View

**Motor Trades Affected by Oppos-
ing Sentiments of Different
Employed Classes**

LONDON, March 23 (*Special Correspondence*)—One of the most difficult questions affecting British trade just now is the acceptance or rejection of payment by results, that is, by output of work. All round the engineering trade there is complaint of diminished output largely traceable to the shortened working week, which from 54 hours is now reduced to 47 hours.

Moreover there is a rankling discontent both on the part of, and arising out of the earning capacity of, semi-skilled workers, by whom is meant mostly workers who have not served an apprenticeship to the trade concerned, and whose output is seen to be larger than that of the average skilled worker.

The General Workers Federation, numbering 1,500,000 workers mainly of the semi-skilled class, approves of payment by results, while the A. S. E. (Amalgamated Society of Engineers) the most powerful and wealthiest trade union, is, at least, divided on the point.

The bearing and importance of this matter on the British motor industry lies in the fact that gradually the motor works are being staffed with union labor, so that the workers' action is tending more and more to be a concerted one, and correspondingly British motor factories are becoming more keenly alive to and affected by the outlook and decisions of some of the older branches of the engineering industry.

JORGENSEN TO ADD NEW UNITS

WAUPACA, WIS., April 5—The Jorgenson Mfg. Co., Waupaca, Wis., which recently increased its capital stock from \$70,000 to \$350,000, is preparing to greatly enlarge its output of priming devices and other specialized automotive equipment. Plans have been accepted for a new brass and aluminum foundry, and an addition to the machine and assembling shop. It is stated that the company has perfected a new type of carburetor designed especially to employ the heavier distillates of petroleum as fuel, which is to be put into production as soon as adequate facilities have been provided. P. J. Jorgenson is president and general manager.

REORGANIZE WRENCH FIRM

MILWAUKEE, April 3—Rapid increase in demand for Blackhawk steel socket wrenches has resulted in recapitalization of the American Grinder Co. Under the reorganization Herman, Herbert and George Brumder, Milwaukee bankers, and George, Adam and Fred Meyer, shoe manufacturers, have come into the company with Herman Brumder as treasurer. Sale of the wrenches is in the hands of C. N. & F. W. Jones, with headquarters at Chicago.

Tractors to Enter British Truck Show

Ruling by Society to Limit Members to Two Exhibitions
Arouses Comment

LONDON, March 23 — (*Special Correspondence*) — The Society of Motor Manufacturers & Traders (Inc.) has sanctioned the inclusion of farm tractors at the show of trucks to be held in Olympia, London, during a week (to be fixed) of October next. Adverse comment is being made in some quarters on a resolution of the Commercial Vehicle committee of the S. M. M. & T., which will limit their bond-signing members to show only at (either or both) the Royal Agricultural Society's show to be held this year at Darlington in July and the society's own truck and tractor show at Olympia in October.

Hitherto bond-signers have been free to exhibit at six shows in Great Britain outside the commercial vehicle show, and usually have been represented at such events as the Royal Agricultural Show, the Royal Highland Show, the Dublin Show, the Brewers' Exhibition, and Bakers and Confectioners, the Grocers and others.

Last autumn, too, there was an excellent display of heavy motor vehicles suitable for municipal and other road work at the Roads and Transport Exhibition at the Agricultural Hall, Islington, which was undoubtedly helpful in propaganda, besides bringing a certain amount of business to the firms represented. It is not quite certain if this resolution applies to farm tractors.

ENGLISHMAN.

MEXICAN OPERATIONS HALTED

WASHINGTON, April 2—The status of petroleum legislation in Mexico is uncertain, according to reports received by the Bureau of Foreign and Domestic Commerce, and in the meantime producers are hampered by the uncertainty

and hesitate to extend their operations.

On Dec. 9, 1919, a petroleum law was passed by the Mexican Senate, but before it becomes effective, it must of course be passed by the Chamber of Deputies and signed by the President. It is unlikely that a special session of Congress will be called and the next session will take place on Sept. 1. Permits to drill wells which had been denied those companies that had refused to abide by the various decrees of the President in the matter of manifestation of claims, taxation, etc., have been granted.

Times Square Jobbers to Run Chain Stores

NEW YORK, April 6—The Times Square Automobile Co., New York, has been reorganized with a capital of \$50,000,000 to do a country-wide automotive equipment jobbing business. Branches operating on a wholesale only basis are planned for every city of 75,000 population or over in the country.

A director of the reorganized company is Allan A. Ryan, vice-president of Stutz Motor Car Co. Among other directors are Hicks Witherbe and C. Crimmins. The company plans to withdraw entirely from the retail business. Sites for branches are now being chosen by five representatives. Locations in Los Angeles and San Francisco have already been obtained.

SENATE APPROVES AIR MAILS

WASHINGTON, April 2—The Post Office appropriation bill, carrying a provision for \$1,415,000 for the establishment of an air mail route between New York and San Francisco via Chicago and Omaha, was passed yesterday by the Senate. It will now come before the attention of the House for further consideration. The House eliminated all provisions for appropriations for an Air Mail Service in its Post Office bill.

An amendment offered to establish a line between the southern states and the north was rejected.

Car Service Demand Promises Results

Railroad Officials, With Suspension of Automobile Industry
Threatened, Speed Action

NEW YORK, April 5—As the result of energetic efforts of the Traffic Division of the National Automobile Chamber of Commerce, the Car Service Commission of the American Railroad Association has addressed a telegram to all railroads calling attention to the serious shortage of cars in automobile territory and the necessity which has forced companies to drive thousands of cars away from the factories.

Railroads are warned that unless the car supply is increased automobile plants are likely to shut down because of inability to ship their products. The commission asked for reports on the present situation respecting automobile cars with semi-monthly reports hereafter.

Investigations of the traffic division show that at Chicago, St. Louis and Cincinnati heavy local freight offerings did not promise immediate resumption of the flow of empty automobile equipment into the manufacturing points. A report of the division says, however:

"The discussions and communications we have had with officials of all the principal lines will be very helpful and results are already apparent from advices we are receiving showing orders issued and cars handled towards the manufacturing territory. Railroad officials at Pittsburgh, Philadelphia and other Eastern points will be visited this week."

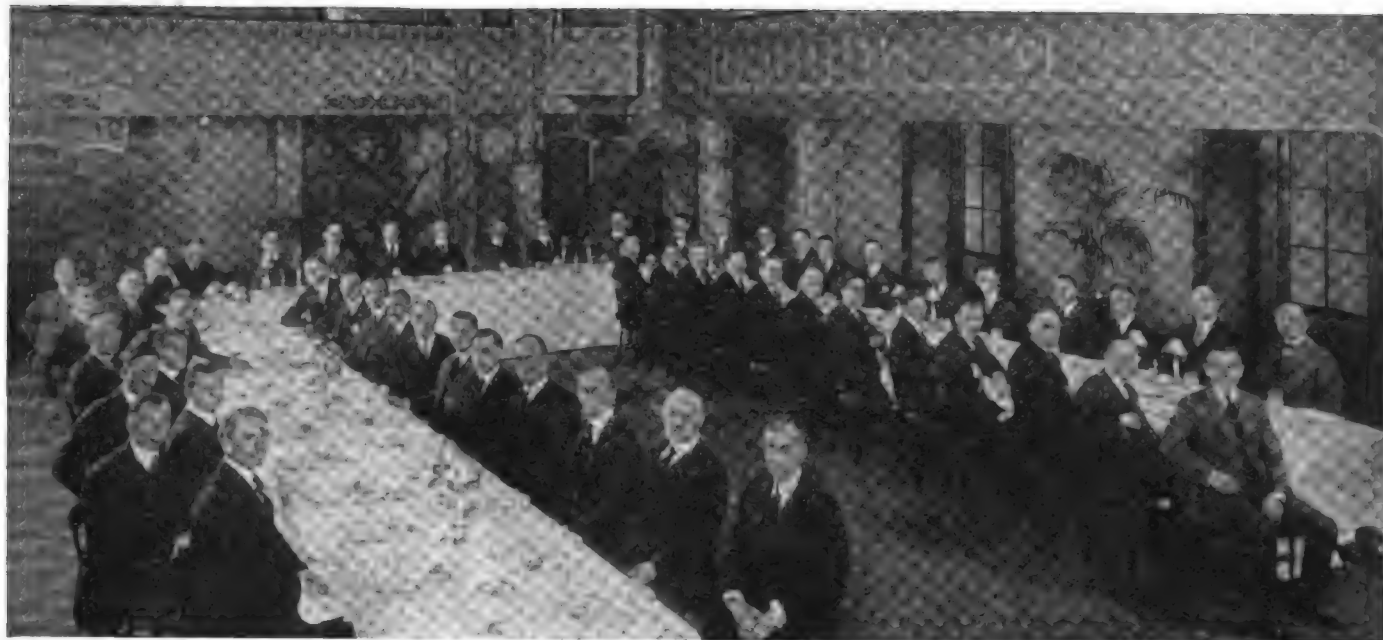
A CORRECTION

THE figures 12,000,000, as the yearly piston production of the Spencer-Smith Machine Co., as given on page 865 of this issue, in the article by J. Edward Schipper, entitled "The Production of Automotive Parts in the Small Town," should read 1,200,000. The higher figure naturally is impossible.

Hudson Reserve Material Stored on Roofs of Factory Buildings



DETROIT, April 2—Determined not to be caught again without an adequate supply of materials, all of the automobile manufacturers are piling up stocks of reserves, using every available inch of storage space. Since the weather became such as to permit hauling in large quantities by motor truck that method has been added to the limited railway facilities. Hudson Motor Car Co has a stock aggregating \$15,000,000, the greatest in its history, stored on the roofs of the factory buildings.



Advertising Managers of the Motor and Accessory Makers' Association

At this luncheon conference at the Hotel Commodore, New York, a committee was appointed to work out organization of an association which will deal exclusively with advertising problems peculiar to their field

Truck Men Discuss Trade Development

Pneumatic Tired Vehicles Have Innings at Timken Convention in Detroit

DETROIT, April 6—In response to an invitation from the sales department of the Timken-Detroit Axle Co., fifty-two truck manufacturers who are customers of the company met recently at Detroit to discuss problems of motor truck manufacturing and marketing.

President A. R. Demory of the Timken-Detroit Co. explained that while the output of axles is steadily increasing, the uncertain quantity and quality of steel together with the difficulty in obtaining other materials in large quantities, such as malleables, stampings and forgings made it impossible to promise greatly increased productions for 1920.

It was the unanimous opinion of the truck manufacturers that the present method of giving trucks a definite rating, or a chassis rating, is the only practicable and sensible system of procedure. Trucks are designed to carry specific loads, with a certain factor of safety, and if they are loaded beyond the capacity rating given by the manufacturer, his responsibility naturally ceases. It was felt that to change present methods would be productive of endless trouble for both the truck builder and the parts maker.

"Speed Wagons" and Brakes

The subject of pneumatic tires for trucks was also discussed and a number of truck builders gave their personal experiences. It was agreed that the pneumatic tire will have its place on motor

trucks, especially on sizes up to 2½ tons. Doubt was expressed by some of them present, however, regarding the success of pneumatics as a commercial proposition on trucks of 3½ and 5 ton capacity, due to braking difficulties and the increased expense of tire equipment.

In discussing the possibilities of the "speed wagon," the majority of manufacturers present seemed to feel that attempts to convert passenger cars into motor trucks had not met with any great success up to the present time. It was felt, however, that there is a very definite market for a vehicle designed to carry about 1500 pounds, to be equipped with pneumatic tires, and to make up in speed what it lacks in carrying capacity.

A number of manufacturers gave their companies' personal experience in designing and building speed wagons, and the majority maintained that such a vehicle should be built along the lines of a lighter motor truck and keep away from passenger car practice. The bevel drive type of rear axle seemed to be favored for this particular class of vehicle.

MONTANA TRACTOR TO BUILD

OCONTO, WIS., April 5—The Montana Tractor Co. of Tinley Park, Ill., will break ground about April 10 or 15 for the erection of an assembling plant of 40,000 ft. at Oconto, Wis., which is to serve northern Wisconsin, upper Michigan, Minnesota and Canada. The building will be laid out so that additional units may easily be erected.

PARK MOTORS BUYS IN CHESTER

CHESTER, PA., April 5—Announcement has been made that the Park Motor Co., controlled by the du Pont interests, will erect an assembling plant here.

Marsh Motors to Make \$1,400 Car

Plant at Cleveland Will Be in Production in Sixty Days on First Model

CLEVELAND, April 6—Marsh Motor Car Co., headed by W. T. Marsh of Boston, and composed of Eastern capitalists, has moved into the new plant erected for the company in Cleveland and will be in production within sixty days on a 4-cylinder car to sell at about \$1,400.

The new factory is practically complete. It is 200 x 500 feet and will be fitted with machinery costing \$300,000. The foundry and other plant buildings have been completed and equipped and now are in operation. The company is capitalized at \$3,500,000—150,000 shares of common stock of no par value, and 100,000 shares of preferred.

All of the common stock has been paid in and the issue of preferred will be put on the market by Boston bankers who are associated with the enterprise. All of the company's officials are Eastern men, chiefly from Massachusetts. During the war the company manufactured munitions for the allies in a plant at Brockton, Mass.

Much of the machinery used in the Brockton plant has been installed in the new plant at Cleveland. The company had planned to equip its Brockton property and build automobiles there, but was persuaded to come to Cleveland by the Chamber of Commerce. For the present production will be limited to a 5-passenger touring car, but the company expects to be in production on all models in the fall.

Kenyons Embark in Cord Tire Making

Will Produce 500 a Day With Patented Tread Design in Oversizes Only.

NEW YORK, April 6—Manufacture of the Kenyon Cord, a new high grade cord tire, has been started by the C. Kenyon Co., of Brooklyn, operating one of the largest fabric rubberizing plants in the United States. For sixty years the company has been engaged in the handling and manipulation of rubber.

Oversize cord tires will be produced exclusively. A new tread of rectangular form has been patented which offers a straight-line resistance to both the side and forward skid. Long wear is predicted for the tread because the design distributes wear over a greater area of wearing surface.

The tires will be made in the Bay Ridge plant of the company, a building of modern concrete construction which was completed a year ago. Two able tire manufacturers have been selected to take charge of manufacturing. It is planned to produce 500 tires a day at the start, but this number can be doubled with existing facilities, as the business grows.

TO HEAR RATES PROTEST

NEW YORK, April 5—So many complaints have been received by the Interstate Commerce Commission that it has decided to grant hearings on proposed freight rate increases to Pacific coast points. If these higher charges are made

effective they will place an added burden on automobile manufacturers. The hearings will be held at New York, May 3; Chicago, May 10; Spokane, May 17, and San Francisco, May 24.

Western manufacturers who buy large quantities of supplies are so aroused over the proposed new commodity tariffs that they are seeking information about ocean shipping facilities and sailing dates of vessels from New York and other Atlantic ports for the Pacific coast via the Panama Canal.

Mark Twain Tires

HANNIBAL, MO., April 6—The Hannibal Rubber Co. is being organized here to manufacture a line of tires and equipment to be known as the Mark Twain brand, in honor of the well known writer whose birthplace was in this city. Ground has been broken for the buildings.

FEDERAL RUBBER BUILDS

MILWAUKEE, April 5—The Federal Rubber Co. of Illinois, with general offices and main works at Cudahy, a suburb of Milwaukee, has let contracts for the erection of another large factory addition, to be six stories high, 200 x 210 ft. in size, and cost about \$350,000 with equipment and machinery. The Federal plant already is one of the largest in the Central States and further additions are projected which will make it one of the most extensive producers of fabric and cord tires and mechanical rubber goods in the entire United States.

Three-Wheeled Taxi Appears in Berlin



Owing to the scarcity of material an ingenious inventor of Berlin patented a three-wheeled taxi, which is more easily navigated. The engine is of two-cylinder motor and placed over the front by which the taxi is steered. The fuel consumption is much less than American-made machines and can make about 30 miles on one gallon of gas. The speed of the new taxi is 45 m.p.h.

Dunlop Establishes Offices in Buffalo

Work on Construction of Big Tire Plant Rapidly Getting Under Way.

BUFFALO, April 7—Excavation for the initial buildings in the \$15,000,000 tire plant, to be erected on the River road Buffalo, by Dunlop America, Ltd., has been started. A miniature railroad has been laid out on the immense tract of land acquired by the company, to haul dirt and materials to be used in the construction of the plant.

Two large temporary frame buildings have been erected. One is being used by house officers and the executive staff of the corporation. The other is being occupied by the Foundation Co., of New York, which has the contract for the erection of the mammoth plant.

The main offices of the company are now being established in the temporary building, on Two-mile Creek road, just off River road. Although some of the officials will remain in New York City for a brief period, most of them are moving to Buffalo.

R. J. Dillon, assistant treasurer, already is on the ground. He said that after this week the main offices of the company would be located in the Two-mile Creek building. All business thereafter will be conducted from Buffalo or, to be exact, from the town of Tonawanda, as the plant is 4000 feet beyond the Buffalo city line.

F. C. Walcott of New York is president of the American organization of the big English corporation. He will spend much of his time in New York City, making frequent trips to Buffalo.

Among the other officials who will establish themselves in Buffalo are: P. D. Saylor, vice-president and general manager; A. P. Taliaferro, treasurer; S. S. Walcott, secretary.

Many of the buildings which will make up the plant will probably be completed during the coming summer months. All of the structures will be of steel and brick construction. Large consignments of steel have been received.

The Dunlop plant will include three or four cotton mills, each with 80,000 spindles. These mills will weave fabric for auto tires. The firm, it was said, plans the immediate erection of one of these cotton mills, adding two or three more later.

RUBBER STATISTICS

NEW YORK, April 6—Analysis of statistics of the rubber industry, compiled by the Rubber Association of America, shows that the increase of crude rubber consumption in 1918 over 1917 was 5.39 per cent. The tire industry used 76.25 per cent of the total crude rubber consumption in 1918, as compared with 73.52 per cent in 1917. Statistics of the 1919 consumption are not complete as yet. This year will show a large increase in the percentage used in tires.

Milwaukee to Erect Truck Show Building

Wisconsin Grants Permit to Dealers to Build on State Fair Grounds

MILWAUKEE, April 5—Action toward the erection of another large exposition building at State Fair Park, West Allis, Milwaukee County, for the accommodation of the motor truck merchandising trade in a manner similar to that already provided for the passenger car trade, has been taken by the Wisconsin State authorities.

The State Department of Agriculture, which directs the annual State Fair, has granted permission to the motor truck division of the Milwaukee Automotive Dealers' Association to erect a building about 100 x 400 ft., costing \$60,000 to \$75,000, which will be situated near the present Motor Hall Building, of approximately equal size, erected about five years ago for the use of the Milwaukee distributors and dealers.

At first the existing building afforded sufficient room to handle both passenger and commercial car exhibits, but in the last three years it was necessary to provide a large circus tent as an annex to handle trucks, the permanent structure being adequate only for passenger car and automotive equipment displays.

The Milwaukee Dealers' Association has been desirous of erecting another building for several years, but the intervention of war prevented action until now. The permission granted by the State Department of Agriculture lets the matter rest entirely with the dealers to finance, erect and equip the exposition hall. It is hoped to have it ready by the time of the next State Fair, to be held Aug. 30 to Sept. 4.

AIR MAIL PLANS APPROVED

WASHINGTON, April 3—House conferees on the Post Office bill receded yesterday from their opposition to Senate amendments providing for the establishment of a transcontinental experimental mail airplane service between New York and San Francisco, via Chicago and Omaha. At their request, however, the Senate appropriation of \$1,400,000 for the service was reduced to \$1,250,000. Under the measure the existing airplane mail route between Washington and New York is discontinued.

AMERICAN SIX PRICES RISE

NEW YORK, April 6—American Motors Corp. announces the following prices for its model C American Six: 5-passenger touring, \$2,295; 7-passenger touring, \$2,350; 3-passenger roadster, \$2,350.

OPPOSE ADVERTISING BILL

WASHINGTON, April 3—Representative Thompson of Ohio has introduced in the House a bill which would impose a tax of 10 per cent on all advertising investments in publications with more than 5000 circulation and a tax of 15 per cent

on all other advertising media. The advertising interests of the country have given notice that they will fight vigorously against the passage of such a measure. The truck interests are particularly incensed because they contend it would impose an unjust tax on the development of an industry now in its infancy, but which is destined to revolutionize transportation.

Ryan Gives Terms of Stutz Settlement

NEW YORK, April 7—The latest development in the sensational "corner" in Stutz Motor stock, which resulted in its being barred from the Stock Exchange, is the announcement by Allan A. Ryan of the terms upon which the "shorts" will be permitted to settle. At the same time Ryan denied emphatically that he had anything to do with the skyrocketing of Stutz stock.

Under the offer to the "shorts," terms must be agreed upon between Ryan and the Stock Exchange committee and this agreement would be binding. It was stipulated by Ryan that, after the settlement, the Exchange "shall not either rule off the stock or deny it the privilege of free trading on the floor." He expressed willingness to sacrifice his seat on the Exchange if Stutz stock is ruled off or free trading in it not permitted.

"I shall continue to declare a dividend of 20 per cent until the stock is doubled in value," he said. "I have sufficient resources to take up every share of the stock."

The dividend statement is considered somewhat cryptic, for stock dividends voted in the last few weeks have doubled the original 100,000 shares.

Highways Committee Outlines Activities

WASHINGTON, April 7—A transportation committee of the Federal Highway Council was formed here to-day, nearly a score of members of this committee responding to the invitation of S. M. Williams to accept positions on the committee and attend the meeting.

The transportation committee to-day approved a comprehensive program of activities embracing a study of and active assistance in such movements as rural motor express, return loads, snow removal, short haul work, terminal problems, educational work in universities and schools, motor truck haulage costs, motor truck statistics, legislation—state and national—affecting highway transportation, and a general study of highway construction and highway problems.

STUDEBAKER ISSUES STOCK

NEW YORK, April 6—Directors of the Studebaker Corp. to-day declared a common stock dividend of \$15,000,000 or 33½ per cent of the amount outstanding. It was announced that the new stock, which brings the common outstanding up to \$60,000,000, will carry the cash dividend payable June 28.

Handley Page Takes British War Planes

Syndicate Makes Clean Sweep of Government Supplies—Expect Sales Here

LONDON, March 23 (*Special Correspondence*)—Some speculation as to the meaning of the event has been aroused by the British Government having disposed of a vast quantity of aircraft material to a syndicate headed by Handley Page, the well known aircraft builder. The value of this deal is estimated at \$500,000,000 (pre-war) and comprises 35,000 aircraft engines, 10,000 war planes, a vast quantity of spares and hangars.

The stuff is described as "surplus," but having regard to the Government's cutting down its expenditure in the aircraft service, and refusal to finance in any way civilian aircraft interests, it is felt in some quarters that such a clean sweep of aircraft stores represents rather a pessimistic outlook. A provision of the contract binds the purchasers to hand over to the Government 50 per cent of the profit on the resales.

It is thought likely that the bulk of these will be made in America, where the demand is bigger than construction can cope with. The state of the exchanges favors the business in this quarter, and, moreover, it is significant that Handley Page, who took an important part in the "deal," left for America as soon as it was complete.

It was stated recently that the British Government had disposed of a number of air-cooled aircraft engines in the United States.

FARMERS FAVOR HIGHWAYS

NEW YORK, April 5—Replies received by the American Farm Bureau Federation disclose that farm sentiment is very strongly in favor of a national highways system constructed and maintained by the Federal Government. It was announced here to-day that replies received from local federated organizations in 28 states show a preponderance of sentiment in favor of such a system. The Federation in this respect is following in the footsteps of the National Grange.

COLUMBIA STOCK, \$6,000,000

DETROIT, April 6—Columbia Motor Co.'s stockholders will be paid a 700 per cent stock dividend following authority given the company by the Michigan Securities Commission to increase capital from \$500,000 to \$6,000,000. New shares will be issued by the company, each stockholder receiving eight shares in return for each share now held. The shares are of \$10 par value.

In addition to the dividend the company will sell 100,000 shares at par to present stockholders. The company paid 18 per cent dividends last year and so far this year stockholders have been paid at the rate of 6 per cent.

Automotive Financial Notes

United States Rubber Co.—Annual report shows net sales for 1919 of \$225,589,465 compared with \$215,398,425 for 1918. After payment of preferred dividends and dividends on minority stock of subsidiary companies there remained \$12,669,194 applicable to the common, which was equal to \$17.59 a share on the \$72,000,000 outstanding as compared with \$30.85 on the \$36,000,000 outstanding at the close of the previous year.

Automotive Electric Co.—Incorporated at \$25,000 in Portland, Ore., to conduct electrical repair business and manufacture garage testing equipment.

Plainfield Body Corp.—Organized at Plainfield, N. J., with \$250,000 capital, to build bodies for Plainfield and Greensboro, N. C., plants of American Motors Corp.

Paul G. Niehoff & Co.—Takes over Northern Machine Co., at 341 East Ohio Street, Chicago. Will go into production of new line of electrical testing instruments and garage equipment for automotive trade.

Simplex Steel Stamping & Mfg. Co., St. Louis—Has sold Simplex rim remover to Niswander Mfg. Co., Quincy, Ill.

Goodyear Tire & Rubber Co.—Second employees' stock sale resulted in disposal of \$1,000,000 preferred stock during first three days of sale. Stock pays 7 per cent, with 3 per cent bonus to employees. Employees who own stock now number 19,107.

Lincoln Motor Co.—Employees in service at least a year will be allowed to purchase class A stock at 20 per cent below par.

Automotive Body Co., Wauseon Ohio—Incorporated with \$50,000 capital.

Sterling Tire Corp., Rutherford, N. J.—Declared initial quarterly dividends of 2 per cent on cumulative sinking fund preferred, 1½ per cent on preferred and 1 per cent on common.

Bessemer Motor Truck Co.—Will sell additional \$100,000 preferred stock to finance increase in stock of parts and manufacturing materials to take care of dealers.

Gary Auto Body Mfg. Co., Gary.—Capitalized at \$250,000, with Franklin T. Fetterer, W. M. Staley and W. B. Levey as directors.

Globe Body Co., Fostoria, Ohio—Will build addition to plant to assemble wooden portion of bodies instead of having work done outside.

Vesta Accumulator Co.—Changes name to Vesta Battery Co. and will increase capital to finance expanding business.

Union Truck Mfg. Co.—Trustee in bankruptcy will make final report at meeting of creditors at 2 Rector Street, New York, April 9.

Moto-Meter Co., Inc., Long Island City.—Purchased factory it now occupies and will provide added equipment to meet demand for product.

Packard Motor Car Co.—Announces

officially that quarterly dividend is 2½ per cent instead of 2 per cent, as previously announced.

United States Compression Inner Tube Co.—Announced that company, which is \$5,000,000 Tulsa, Okla., corporation, will erect \$1,000,000 plant in or near Los Angeles.

Fort Wayne Tire & Rubber Co.—Increases capital from \$1,000,000 to \$2,500,000 and will expand business. Annual report showed assets of \$762,094.

Federal Motor Truck Co.—Annual report shows gross sales of \$10,525,265 with balance of \$861,707 after Federal taxes, compared with a net balance of \$362,635 at the close of last year.

Willys-Overland Co.—Directors voted to increase outstanding common stock by 50 per cent and offer \$20,000,000 new common to common shareholders of record April 23 at \$25 per share in ratio of one new share for two of old. New funds are needed to increase working capital for handling production planned for this year.

Globe Rubber Tire Mfg. Co.—Declared stock dividend of 10 per cent in addition to regular cash dividend at 6 per cent annual basis.

Art Work Shop, Buffalo—Ground broken for two-story, 75 x 180 brick building to increase output interior hardware for manufacturers closed automobile bodies.

L. & W. Rubber Co., Carrollton, Ohio—Capital increased from \$500,000 to \$1,000,000 for erection and development of new cord tire plant now under construction. Anthony W. Senz, former general sales manager Gordon Tire & Rubber Co., has joined organization.

Stewart Motor Corp., Buffalo, has increased its capital from \$1,000,000 to \$2,500,000 to double its production.

Columbiana Foundry Co., Pittsburgh, will erect a foundry for use in making materials used in automobile construction. Will erect \$200,000 plant.

B. F. Goodrich Co.—Offers for sale \$30,000,000 five years 7 per cent convertible gold notes dated April 1 carrying detachable warrants entitling holders to purchase common stock at \$80 a share. The proceeds of the note sale will be used to increase working capital and reduce current liabilities. Current assets of the company amount to \$85,874,000.

Spicer Mfg. Co.—Offering 60,000 shares of common at \$29 a share. Part of proceeds will be used to acquire Salisbury Axle Co.

Hood Rubber Co.—Common stock increased from \$3,500,000 to \$5,500,000. Additional stock to be distributed as dividend in proportion of two new shares for every three now held.

McGraw Tire & Rubber Co.—Sales for year ended Nov. 30, were in excess of \$7,000,000 while net profit amounted to \$380,392.

John Obenberger Forge Co., West Allis, Wis.—Capital increased from \$250,000 to \$500,000 to double production of automotive drop forgings.

American Safety Signal Co.—Establishing factory at Saukville, Wis., to make automatic signal devices and automotive equipment.

Claus Automatic Gas Cock Co.—Increases capital to erect its own brass foundry, at cost of \$25,000.

Whitney Tractor Co.—Incorporated with \$1,000,000 under presidency of A. B. Whitney, formerly head of Ohio Mfg. Co.

Bank Credits

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

Commercial paper rates are unchanged, while the more sensitive Stock Exchange money rates show the effect of the improved Federal Reserve ratio. Call money loaned last Monday at 6 per cent, after renewing at 7 per cent. There seems little probability of lower commercial money rates in the immediate future.

In connection with the credit situation, it is interesting to note that the Federal Reserve Bank figures on Saturday were interesting chiefly, not because the System as a whole gained \$23,000,000 in gold, for that was expected. The principal interest lay in the redistribution of gold already held by the System. The New York Bank gained 30-odd millions from other banks, as well as 20 millions from abroad, with the result that its reserve ratio stood at 42.2 per cent, the highest figure since the middle of last December.

In general, it may be said that Eastern Reserve banks reduced their bill holdings and gained gold, while Western and Southern banks added to bill holdings and lost gold. How far this money movement represented natural forces, and how far deliberate action, it is impossible to say. The whole System showed smaller bill holdings, more than offset by increased purchases of Government certificates. Government deposits in Reserve banks, it will be noted, are now at the very low figure of 10 millions.

TARGA FLORIO DATE SET

PARIS, March 20 (*Special Correspondence*)—Sunday, Sept. 5, has now been fixed as the date of the Targa Florio race on the Island of Sicily. This event, which is one of the oldest-established races in Europe, will be reserved to stock cars for the first time. Different classes are provided, according to cylinder area. The winner of the Targa will be the fastest car, irrespective of class, but there will also be a classification according to cylindrical capacity.

BUICK CORRECTION

The new price of Buick model K 49 was inadvertently quoted in this magazine recently at \$2,865. The price should be \$1,865.

Men of the Industry

A. G. Phelps, formerly with Dayton Engineering Laboratories Co., has assumed his duties as chief engineer of Elkhart Carriage & Motor Car Co.

Orin S. Beroth, has resigned as service manager of Indiana Truck Corp. to become director of service in motor truck division of Stoughton Wagon Co., Stoughton, Wis.

Ralph Keller, of the H. E. Lesan Co., will handle all Apperson Bros. advertising after July 1.

Charles A. Balton, of Balton Engineering Corp., Buffalo, is attempting to organize at Depew, N. Y., a new motor car company of which he will be engineer.

H. C. Buchanan has retired as production superintendent of the Kelly-Springfield Tire Co. at Akron, to take a similar position with the International India Rubber Corp. at South Bend, Ind.

Paul H. White has been made chief engineer of the Indiana Silo & Tractor Co., Indianapolis.

Charles M. Manly, past president of the S. A. E. and C. B. Veal, a member of the S. A. E., have been retained as consulting engineers and experts by the Keylineoil Suspension Corp. of New York.

Courtney Johnson, production manager of the Dort Motor Car Co., has been promoted to assistant to the general manager.

L. C. Gates, has been made manager of the sales organization of Goodyear Tire & Rubber Co.

T. J. Toner, director of sales for Maxwell-Chalmers, has left the service of that organization. No information was given out as to the reason for his resignation and Toner made no announcement of his future plans. He is succeeded by B. A. Lyman, assistant director of sales and former chief of the accounting department.

A. M. Pearson, general sales manager of Defiance Motor Truck Co., has been promoted to the post of assistant general manager and has been made a director of the company.

Martin Kolbenstetter, organizer of the Kol-Ben Wheel Co., Cadillac, Mich., has resigned from the organization. He has opened temporary offices in Detroit, and is said to be planning a new company for the manufacture of wire wheels and equipment.

L. D. Graham, former wholesale distributor for Apperson automobiles with headquarters in Chicago, has been made general sales manager of the Denby Motor Truck Co. Graham succeeds Percival Dodge who resigned to take up other work though his future connection has not been announced.

Harry N. Douthitt has been made general manager of the Detroit Transmission Co. and assumed his duties today. Douthitt has been associated with the Ford Motor Co. operations at River Rouge.

John Perkins, widely known in the truck industry and for some time superintendent of the Packard truck division, has been placed in charge of production for the Lewis-Hall Motors Corp.

W. B. Walker, purchasing agent of Columbia Motor Co., has tendered his resignation to become associated with the DuPont Motor Manufacturing Corp., Wilmington, Delaware.

Charles A. Tucker, who has been actively engaged in sales work for the last 20 years, has been appointed general manager of Olds Motor Works at Lansing. In this position he will direct the sales of the Oldsmobile throughout the United States.

V. I. Montenyohl and L. L. Smith, credit managers of B. F. Goodrich Co., at Akron, have been elected assistant treasurers of the corporation. The former has been in the service thirteen years, and Smith is just completing his twelfth year.

H. S. Warwick has been elected vice-president and sales manager of the Monitor Motor Car Co., Columbus. He was formerly in the insurance and realty business.

J. B. McGaughy has been made general manager of the M. & D. Auto Top Co., Columbus. He was formerly with the Peters & Heron Co., makers of automobile equipment.

Gil Anderson, an outstanding figure in automobile racing history, has returned to the Stutz Motor Car Co. as head of the experimental engineering department.

Edward Fraser Carson has resigned as sales and advertising manager of the Acheson Graphite Co., Niagara Falls, to take up the same work for the White Hickory Motor Corp., Atlanta, Ga.

Hammond D. Baker, formerly technical traveling representative for United Motors Corp., has been appointed manager of the Detroit office of Roller-Smith Co.

Charles A. Tucker has been appointed general sales manager of the Olds Motor Works. He formerly was connected with the Nebraska Oldsmobile Co. at Omaha.

Friend Motors Elects Officers for 1920

PONTIAC, MICH., April 6—At a meeting of stockholders of Friend Motors Corp., directors for the ensuing year were elected, and they in turn named officers with Otis Friend as president. Other officers are J. B. Shifflet, first vice-president, Robert Daily, second vice-president and secretary, H. J. Guthard, treasurer. The officers with E. C. Miller, president of the Osgood Co., Chicago, H. W. Huttig of the Huttig Sash & Door Co., St. Louis, and John Bluemm, compose the board.

Production of the Olympian car began March 15, and arrangements have

been completed for an output of five cars a day beginning April 15, and an increase to ten cars a day within 60 days. Many improvements have been made to the Olympian involving a greatly increased cost, and the list price has been raised to \$1585. A new six-cylinder car to be known as the Friend Six will be manufactured by the company, production of which will begin in the summer.

ADOLPH SAURER DIES

NEW YORK, April 2—Adolph Saurer, a pioneer of the motor truck industry, died in Arbou, Switzerland, on Feb. 23. Saurer was the owner of a large machine shop devoted to the manufacture of textile machinery, which had been in existence since the sixties of the past century. He was early to recognize the importance of the internal combustion engine. In 1892 the first gasoline engine was built in the Saurer works, which was favorably commented on by engineers at the time. The firm first took up the manufacture of stationary and later added marine engines. As a further development of this line an automobile engine and the Saurer motor truck were later brought out. The truck proved particularly successful and, in addition to being manufactured in Switzerland, licenses for its manufacture were issued in France, Germany and the United States.

EXPORT HEAD GOES TO CUBA

NEW YORK, April 5—The unusual demand for motor vehicles in Cuba has made it necessary for Col. Fred Cardway, vice-president and general manager of the Packard Motors Export Corp., to make a personal visit to the island to make a thorough analysis of the situation not only for passenger cars, but for trucks as well. Cuba leads all Latin America in the importation of motor vehicles.

F. & W. PULLER IN NEW HANDS

INDIANAPOLIS, April 5—The Indianapolis Metal Products Co. is now manufacturing the F. & W. universal wheel and gear puller, which formerly was manufactured by the F. & W. Mfg. Co. The F. & W. puller combines in one tool a device that can be used on any propeller, flywheel, cam or gear pulling job.

FIRM TITLE CHANGED

NEW YORK, April 2—Engine Patents, Ltd., with offices in London and Cleveland, has changed its name to Ricardo & Co. (Engineers), Ltd. H. R. Ricardo and H. A. Hetherington are the technical directors.

BIG HAYNES DIVIDEND

KOKOMO, IND., April 6—A stock dividend of 60 per cent has been declared by the Haynes Automobile Co. The stockholders also voted to build immediately a \$250,000 malleable iron foundry and a body plant with a capacity of 50 bodies a day. C. H. Haynes of San Francisco, a brother of Elwood Haynes, was elected a director to succeed the late Stephen Tudor.

Calendar

SHOWS

April 21-22—San Francisco. National Aeronautic Exposition. Exposition Auditorium.

Oct. 6-16—New York. Electrical Show. Grand Central Palace. George F. Parker, Manager.

Dec. 10-18—New York. Motor Boat Show. Grand Central Palace.

FOREIGN SHOWS

May 15-June 13—Cars, Parts and Accessories. Antwerp.

June 26-July 25—Commercial vehicles, tractors, camions and engines. Antwerp.

July 9-20—London, England. International Aircraft Exhibition. Olympia. The Society of British Aircraft Constructors.

Aug. 7-Sept. 15—Motorcycles, sidecars, etc. Antwerp.

October—London. Commercial Vehicle Show. Olympia.

November—London. Passenger Car Show. Olympia.

CONTESTS

May 1—Hanford, Cal. Dirt track.

May 31—Indianapolis, Ind. Speedway.

May 31—Brockport, N. Y. Dirt track.

June 1—Omaha, Neb. Truck Reliability Run.

June 12—Uniontown, Pa. Speedway.

June 17—Portland, Ore. Dirt track.

June 19—Ogdensburg, N. Y. Dirt track.

July 4—Tacoma, Wash. Speedway.

July 4—Hanford, Cal. Dirt track.

July 4—Spokane, Wash. Dirt track.

July 5—Batavia, N. Y. Dirt track.

July 17—Warren, Pa. Dirt track.

July 24—Watertown, N. Y. Dirt track.

July 31—Fulton, N. Y. Dirt track.

Aug. 7—Erie, Pa. Dirt track.

Aug. 14—Buffalo, N. Y. Dirt track.

Aug. 20-21—Middletown, N. Y. Dirt track.

Aug. 21—Johnstown City, Pa. Dirt track.

Aug. 28—Canandaigua, N. Y. Dirt track.

Aug. 27-8—Flemington, N. J. Dirt track.

August, 1920—Paris, France. Grand Prix Race. Sporting Commission Automobile Club of France.

Sept. 1—Glidden Tour—N. Y. to San Francisco.

Sept. 5—Targa Florio Race, Sicily.

Sept. 6—Hornell, N. Y. Dirt track.

Sept. 6—Cincinnati, O. Speedway.

Sept. 6—Uniontown, Pa. Speedway.

Sept. 17-18—Syracuse, N. Y. Dirt track.

Sept. 25—Allentown, Pa. Dirt track.

Oct. 1-2—Trenton, N. J. Dirt track.

Oct. 8-9—Danbury, Conn. Dirt track.

CONVENTIONS

April 12-17—Hot Springs, Ark. Eighth Annual Convention, United States Good Roads

Association; Fourth Annual Convention. Bankhead National Highways Ass'n.

April 27-29—Atlantic City. Increased Production Convention, Chamber of Commerce of the United States.

April 29-May 1—Detroit, Mich. Fourth Annual Meeting and Convention, American Gear Manufacturers Ass'n.

May 9-12—Independent American Petroleum Congress, Congress Hotel, Chicago.

May 12-15, 1920—San Francisco. Seventh National Foreign Trade Convention.

May 20-30—Atlantic City. Third American Aeronautic Congress, Aero Club of America.

June 22-25—Asbury Park, N. J. Annual meeting American Society for Testing Materials.

S. A. E. MEETINGS

June 21-25—Ottawa Beach, Mich. Summer Conference.

Post Office to Get

Caproni Mail Planes

WASHINGTON, April 3—Fifteen Caproni biplanes, equipped with two tractor engines and one pusher engine, with a total of 720 hp. to each plane, will arrive in this country shortly from Italy and will be turned over to the Post Office Department by the Navy Department for use in the Air Mail Service. These airplanes were purchased by the Navy for war purposes and are being turned over to the Post Office under legislation passed by Congress and authorizing the transfer of aviation equipment from the War and Navy departments to the Post Office Department.

The Caproni planes, when equipped with three Liberty engines, will have a total of 1200 hp. per plane and will be capable of carrying 2700 lb. of mail each for 5½ hr. These planes have a wing span of 76 ft. 9½ in., about 5 ft. more than the largest American-built plane now used in the Air Service. Fully loaded and including gas and oil, they will weigh 13,137 lb. The largest American planes, carrying 1200 lb. less mail when fully loaded, weigh 9456 lb. The speed of the Caproni is set at 105 m.p.h., while the largest American planes now operated yield 108 to 112 m.p.h.

Foreign Opportunities

WASHINGTON, April 3—The Bureau of Foreign and Domestic Commerce, Department of Commerce, has received requests for automobiles or parts agencies of business from individuals and companies in foreign countries. These are

listed below. For further information address the Bureau of Foreign and Domestic Commerce and specify the Foreign Trade Opportunity Number.

An agency is desired by a man in Yugoslavia, who has lived in the United States and is familiar with trade methods, for the sale of automobiles, etc. References 32395.

A firm of merchants in England desires to secure the sole agency for the sale in the British Isles of motor cars and lorries at popular prices. Quotations should be given c.i.f. English port. References.

A company in Egypt desires to purchase automobiles, tires and accessories. Quotations should be given f.o.b. New York. Payment in United States currency; confirmed credit in New York bank. References. 32401.

A merchant in Canada desires to secure a distributing agency for bicycles and automobile tires. Quotations should be given f.o.b. Canadian destination. Payment, cash. References.

A man in Algeria desires to secure an agency for the sale of automobiles and accessories. Quotations should be given c.i.f. Algeria. Payment against documents. Correspondence may be in English. Reference. 32413.

G.M.C. TO MAKE MORE TRUCKS

PONTIAC, MICH., April 5—Authorization for expansion of the General Motors truck plant in this city, to make it one of the largest in the world, has been announced here. The plans call for additional buildings which will provide 160,000 ft. of floor space. Production for the year ending July 1 will approximate 10,000 trucks.

Motor Boat Makers

Set December Show

NEW YORK, April 3—Definite decision was made at the March meeting of the executive committee of the National Association of Engine and Boat Manufacturers to hold the next Motor Boat Show in New York in December at Grand Central Palace. The dates are Dec. 10 to 18. This week was the only time that the Palace could be secured. The decision was the result of discussion that took place during the recent show, at which time many members signed a petition favoring an earlier show date.

At this same meeting of the executive committee, officers of the association for the current year were chosen as follows: Henry R. Sutphen of the Elco Works, president; John J. Amory, Consolidated Shipbuilding Corp., first vice-president; Charles A. Criqui, Sterling Engine Co., second vice-president; George F. Lawley, third vice-president; James Craig, treasurer.

MACHINE COMPANIES MERGE

DETROIT, April 5—Announcement has been made of the consolidation and reincorporation under the name of the Standard Gear Co., of the following concerns. Langtry Machine Co., W. M. B. Machine Co., Michigan Standard Gear Co., Detroit Standard Gear Co., and Mead Mfg. Co.

The headquarters of the consolidated company will be at 700-704 Commonwealth Avenue, Detroit. The president and treasurer of the new corporation is Dell A. Mead, the vice-president and secretary, W. R. Mead.

AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

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The Airplane and Automobile in Germany To-day

The status of the automotive industry in that enemy country has been more or less clouded since the armistice suspended hostilities. But competition from German makers may come in 1921, although the present conditions are shrouded in mystery.

By W. F. Bradley

PARIS, March 27.

ACCORDING to a member of the French technical mission now in Germany, the aerial activities of our late enemies have been greatly exaggerated. This mission, which is under the control of an English general, has as its chief of section Colonel Dorand, formerly head of the technical section of the French Air Service. Members of the mission are engineers from French aviation factories.

Soon after the armistice Germany tried to avoid the peace conditions by the formation of numerous aerial navigation companies, each of which secured a number of military planes and, in order to give their scheme an appearance of legality, mapped out routes and advertised civil services extensively. This plan was frustrated, however, by the technical commission, which has power to examine all machines and to condemn those suitable for military use.

Germany is no longer manufacturing planes. During the war the aviation industry was considerably developed, all the existing factories being increased in size and a large amount of work being given to non-specialized outside firms. With the armistice all these firms returned to their former occupations, or to new work, such as the construction of tractors, house furniture, automobiles, etc.

While there is no military aviation in Germany at

the present time, this member of the technical commission is of the opinion that Germany could regain its former military power in the air within three months. This would only be possible, however, at great financial cost and, as all the Allied nations could return to their war basis in the same length of time, Germany does not possess any particular advantage.

PARIS, March 25.

OUT of 60 German automobile factories, only 15 are in production at the present time, declares André Laurent in an article published in *l'Automobile* of Brussels. Out of these 15, only the 4 most important firms have been able to get the necessary amount of supplies and raw material to increase their output above that of pre-war days.

The German automobile factories are unable to meet the home demand. This does not prevent them, however, from sending their products to Holland, India, Austria, the Scandinavian countries and, particularly, Russia, where they are able to obtain in exchange gold and platinum from the Ural under advantageous conditions. Last December Benz had 300 chassis waiting at Rotterdam for shipment to India.

The cost of German automobiles is comparatively low and it is certain that their quality is higher than in 1913. If account is taken of the rate of exchange,

their success need not cause surprise when it is learned that a 12-34 hp. car, with all the latest improvements, can be sold for 40,000 marks, and that the six-cylinder Opel, 18-50 hp., which is a successful copy of the Rolls-Royce, is sold for 70,000 marks. Shortly, a small car will be brought out at 10,000 marks.

"Owing to the great irregularity of supplies and raw material, all the manufacturers, with the exception of the small group mentioned above, are feeling their way cautiously and for the time being do not contemplate any increase in the size of their factories," the article states. "This state of affairs may change in the future, but for the moment the situation can be summarized as follows:

"1920: Apparent stagnation, projects, preparation, advertising.

"1921: An offensive, surprise, abundant production and novelties.

"The German models for 1920 are entirely on standard lines. They are the 1914 types with the addition of lighting and starting and a few improvements suggested by the war. They are fitted with detachable steel wheels, generally for 820 x 120-mm. tires.

"The carbureter is generally of French make. Gasoline pressure is obtained by a hand pump, automatic pressure having been abandoned. Lubrication is by means of a pump and splash, or, in other words, the circulating constant level type, with all the oil contained in the aluminum basechamber. The use of copper and brass is reduced to the lowest possible limits, for the present price of copper is 550 marks per kilogram. Radiators are generally V-shape. Water circulation is by pump, with the use of a fan. There is nothing special about the other parts of the chassis. Steering is always on the right.

"Bodies are all-metal and on all German cars the top is now hidden in a recess formed within the body. As an indication of the cost of motoring in Germany, it may be stated that a liter of gasoline now costs 5 marks 50 (nominally \$5 per gallon), and that a 32 x 4¾-in. tire cannot be obtained for less than 1600 marks. Even at that price the quality of the rubber cannot be guaranteed. Generally German roads are in good condition, many of the main highways having been remade.

"Aerial transportation is being well developed in Germany. Landing grounds and stations are being established everywhere. There are regular airplane services between all towns of importance, and prices are reasonable. The aerial mail is no longer a novelty and for one mark it is possible to send a letter from Hamburg to Berlin. For this moderate charge the letter is taken to the airdrome by plane and delivered to its final destination by automobile, which also waits for the reply. At present this reply could be received in three hours. At the time of which we are writing, the end of 1919 and beginning of 1920, we received it in the middle of the afternoon. Several important international lines are being studied and one firm in the suburbs of Berlin

is completing giant machines which will maintain a regular service between Hamburg and America, with loads of 50 tons and upwards.

"Although this matter is being kept secret, it has been possible to secure information, according to which the trans-atlantic liners are mixed machines combining all the advantages of the lighter and heavier than air types. The factory which has undertaken this task is at present busy with the manufacture of a light and non-inflammable gas invented in 1918 by Professor Schumann. It has a lifting power equal to half that of hydrogen, and it would be quite unaffected by a fire aboard the ship. This indicates that Germany, having lost her fleet, is placing her entire confidence in aerial navigation.

"The German automobile industry also has vast plans. It is now no secret that Krupp is completing tests of a gas turbine which is absolutely silent and economical. No technical details of this machine have yet been made public.

A New Type Rotary Engine

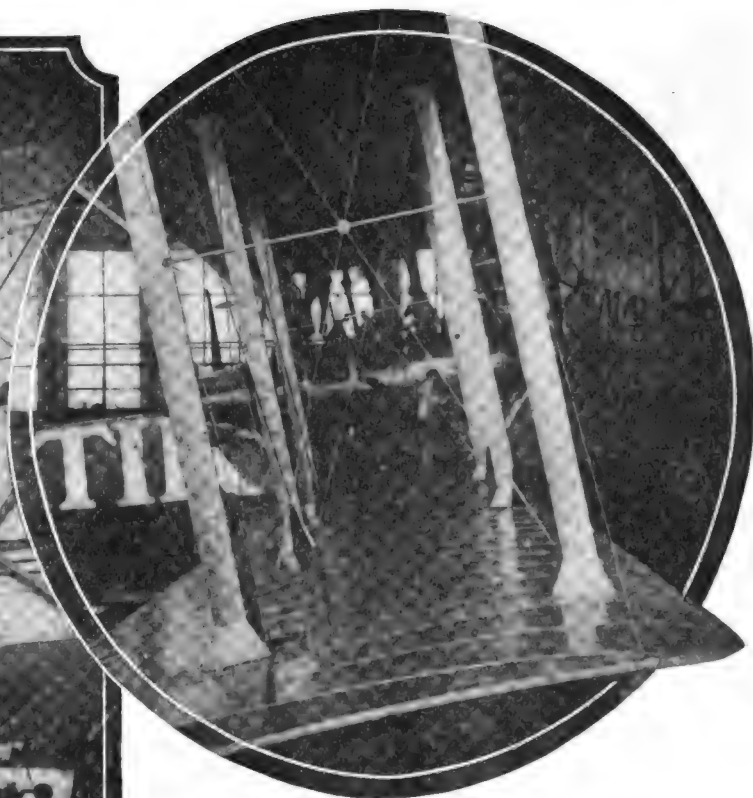
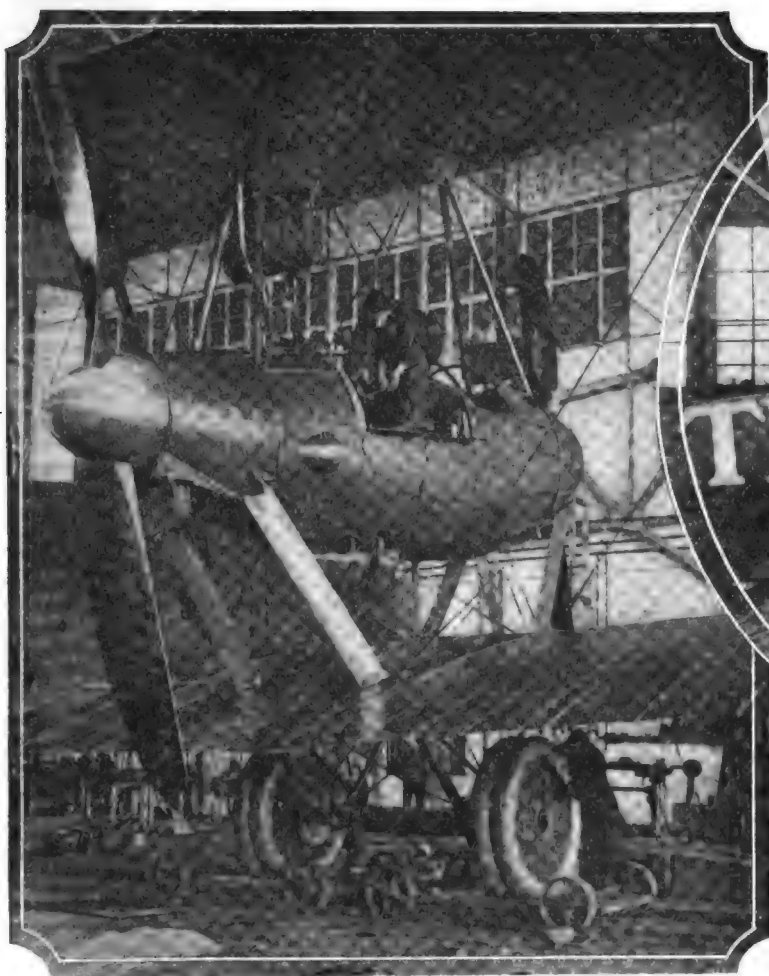
"The joint experimental departments of two important firms are completing a new type of rotary engine which is remarkably flexible, light and free from manufacturing complications. This engine, with a few modifications, may be run on kerosene. It is almost cylindrical in shape and of small overall dimensions. Cooling is assured by a double circulation of air and heat losses are slight. At the same time, work is being advanced on the transmission and intermediate parts. For trucks, electric transmission will be used, and for passenger cars hydraulic transmission, both of these making possible a saving of 40 per cent of power for a given efficiency. Although the two principles are different, the object is the same, namely the suppression of the change speed mechanism and of the differential, while giving to the driver a braking system which is flexible and does not transmit any strain to the mechanism of the car.

"The chassis is extremely low and the rear wheels have independent drive. The machine is to be produced as a 10-hp. model and will enable a saving of 60 per cent to be made on the labor necessary for its construction, compared with a 13-18-hp. car of standard type. It will weigh



© Kadel & Herbert.

The new 22-passenger Aviatik, the largest machine of German construction. This view shows it on its first flight, carrying a full complement of passengers and baggage. Only incomplete details of its construction have been received in America



© Kadel & Herbert.

Left—One of the two engine mountings of the new German Aviatik. The information received in the United States concerning the plane is that it mounts two advanced engines of 220 hp. each and two of 550 hp. each in the rear. Above—View along one of the wings. The enclosed passenger compartment and the forward landing wheels are shown

complete 880 lb., and will cost only half as much as an ordinary machine.

"Experiments with artificial rubber are now approaching success. After having overcome the rapid oxidization of synthetic rubber by the incorporation of organic and aniline basis, it has been possible to produce a substance which is almost inoxidizable, containing about 25 per cent of sulphur, and with which storage battery cases have been made. Since then it has been possible to give a sufficient amount of elasticity to this synthetic rubber by the addition of oils, the physical action of which results in a product which is hardly distinguishable from vegetable rubber and which is quite suitable for automobile tires.

"A huge plan is afloat for the construction of a speedway which will be covered with metal plates on a concrete foundation. This speedway will be 5 miles in length, and will have a width of 140 ft. It is probable that this track will be built in the neighborhood of Hanover. It is suggested that a test laboratory for engines and mechanical parts be erected near the speedway for trials of new models.

Great Secrecy Maintained

"The greatest secrecy surrounds all these plans and projects, and even in official German circles practically nothing is known about the activities of which we have just spoken. There is no doubt that German competition will be terribly severe in 1921. It is reasonable to ask what will be the attitude of Belgian, French, English and American manufacturers in view of this competition. Will they wait until they find themselves face to face with a

terrible competitor who will swallow them after having hypnotized them? Or will they open their eyes and obtain a clear, healthy view of what is happening in the mist on the other side of the Rhine?"

Automatic Photographic Recorder

AN automatic photographic recorder was developed by the Engineers of the U. S. Army for the sound ranging service of the A. E. F. in France. The recorder, in conjunction with either a string galvanometer or oscillograph, will give clear, permanent and continuous records of any magnitude varying with time and which can be converted into an electric current. It is therefore believed that many industrial and laboratory applications of the apparatus will be found. It can be used to record variable currents, rapid temperature changes, pressure changes and intermittent and variable motion such as that of gasoline engine valve mechanism.

The apparatus consists of a motor-driven mechanism which exposes photographic paper or films to a spot of light or shadow and which carries the record through a developing bath and delivers it, exposed side downward, into a fixing bath outside the recorder. It is continuous in action and fully automatic, will handle any length of record and may be operated from a distance.

Prof. A. Trowbridge of Princeton University, Princeton, N. J. has been interested in the development of the device.

Features of Latest Design in New Tractor Engine

The W. S. M. powerplant, constructed on a design by Joseph Van Blerck, is a four-cylinder block type engine, with the cylinder block cast integral with the top half of the crankcase, the casting also incorporating the upper portion of the flywheel housing. It will power the W. S. M. tractor.

REFERENCE has been made previously in AUTOMOTIVE INDUSTRIES to a new tractor engine placed upon the market by the Wellman-Seaver-Morgan Co., from the designs of Joseph Van Blerck. This is a 4-cylinder, $4\frac{3}{4}$ x 6 in. block type engine, and embodies most of the features which have been recognized as desirable in tractor practice in recent years. The cylinder block is cast integral with the top half of the crankcase or, rather, the major part of the crankcase, as the joint between the upper and lower portions of the crankcase is $3\frac{1}{2}$ in. below the crank axis. The upper portion of the flywheel housing is also incorporated in this casting, while the cylinder head is separate.

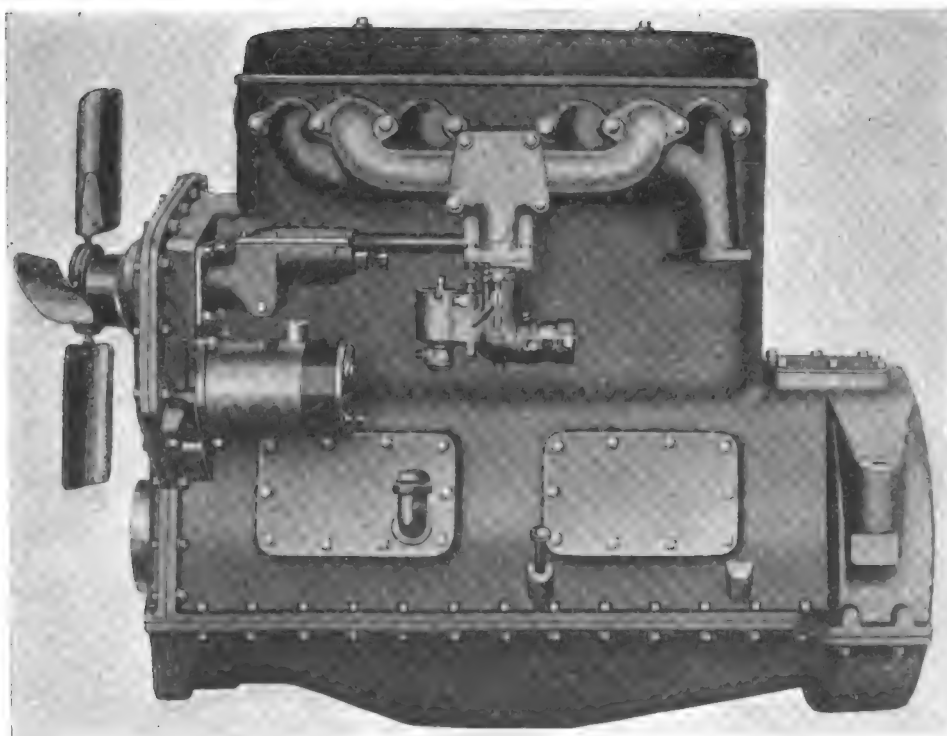
In accordance with late practice in tractor engine design, the cylinders are made with removable sleeves. In case of damage, a sleeve can be removed from the engine by first removing the cylinder head and then withdrawing the sleeves with a spreading tool provided for the purpose. A new sleeve can be inserted readily and, after it is in place, a tight joint is effected by means of a rubber ring in a groove in the crankcase bore through which the sleeve is pressed. The heat of the water in the jacket

vulcanizes the rubber to the sleeve, thus forming a water-tight joint. The sleeve is secured by a projecting shoulder against which the cylinder gasket presses when the head is in place.

Owing to the fact that the joint between the crankcase and oil sump is far below the crankshaft axis, a rigid engine block is secured. Thus, the provision of large-sized hand holes for easy access to the crankshaft and connecting-rod bearings is made possible.

The valves are located in the cylinder head and special attention has been paid to efficient cooling of the valve seats. The combustion chambers are machined all over to uniform size, and the smooth combustion chamber walls thus obtained reduce the tendency toward carbonization. Valves of a built-up type are used, the heads being made of semi-steel, which are screwed onto and electrically welded to stems of carbon steel. It is claimed that the scale, which is formed during the welding process and which is not removed from the stem, protects the latter against burning and also prevents carbon deposits. The engine is designed for three-point support, two supporting arms being cast integral with the flywheel housing and the third point of support being at the forward end, concentric with the crankshaft, a trunnion being formed on the timing gear housing cover.

The crankshaft is made from a chrome nickel steel forging, heat treated. It has a diameter of $2\frac{1}{2}$ in. on the main bearings and $2\frac{3}{8}$ in. on the crankpins, the crankpins being 3 in. long each and the total length of the three main bearings being $10\frac{1}{16}$ in. The pistons are cast of semi-steel, are of more than the usual length and are carefully equalized in weight. The connecting rods are forged from chrome nickel steel and are heat treated. They measure $13\frac{1}{4}$ in. from center to center, considerably more than twice the length of stroke. The cap is secured in place by four $\frac{1}{2}$ -in. bolts of chrome nickel steel. The piston pin end of the connecting rod is fitted with a bronze bushing forming a bearing for the piston pin. An oil tube securely fastened to the rod carries oil under pressure to the piston-



Left side of the W. S. M. engine

pin bearing. All main and crank-pin bearings are of the bronze-back, babbitt-lined type and are securely anchored in place.

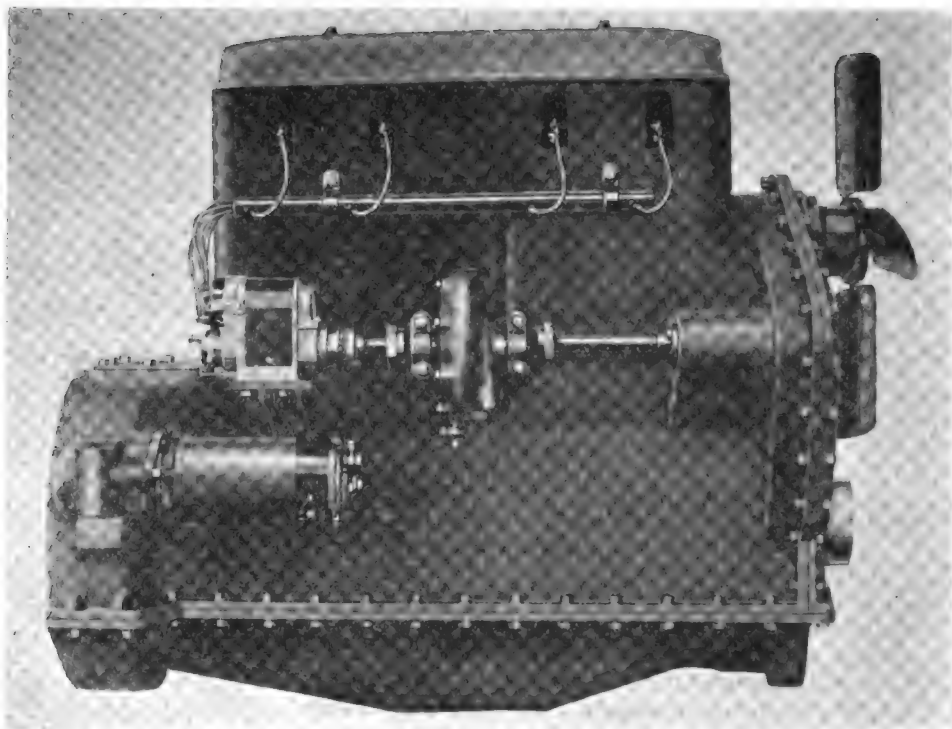
The flywheel is cast of semi-steel and is machined all over. It is bored to fit a flange on the crankshaft, to which it is secured by six bolts, and has the starter gear cut integral with it. The form of the flywheel rim is changed to suit clutch requirements. The timing gears are made of steel and cast iron, with extra wide face and helical form of teeth. There are nine gears and pinions comprised in the camshaft and accessories drive, the two large gears being made of cast iron and the others of steel. The fan is assembled with its bracket as a separate unit. It is of the four-blade type, gear driven, and is lubricated by oil under pressure.

A centrifugal type of governor is fitted and is provided with an adjustment which permits of governing the engine at any speed from 1000 to 1400 r.p.m. The governor is located immediately above the generator on the left side of the engine. The exhaust and intake manifolds are of the ram's horn hot-spot type, and the engine is said to operate satisfactorily on low-grade fuel. A 1½-in. standard type carbureter is fitted and is mounted high so as to make the passage for the fuel mixture as short as possible, thus preventing recondensation.

Ignition is by a single spark, high-tension magneto with impulse starter. The engine is fitted with a standard two-unit electric starting and lighting system, comprising a storage battery and, if desired, a battery ignition system can be substituted for the high-tension magneto. A starting switch, combination cut-out and ammeter are furnished as part of the electrical equipment. The starting motor is mounted on a flange on the crankcase, thus eliminating the use of mounting brackets. The generator is mounted in a similar manner on the opposite side of the engine in front. The high-tension cables of the ignition system are carried in a metal tube which is securely supported by brackets.

One of the most interesting features of the engine is the oiling system, which has been worked out with particular care. All of the main bearings are lubricated by oil under pressure and all main oil passages are 1 in. in diameter. Oil is contained in a sump in the middle of the oil pan and a bayonet type of oil gage indicates the amount of oil in the sump, the gage being located on the left-hand side of the engine, looked at from the rear. A pressure gage is mounted on the oil system beyond the sump and indicates the pressure under which oil is being fed to the bearings.

The oil pump is of the gear type and is driven at 1 1/6 times crankshaft speed (faster than customary), by a helical spur gear, direct from the main timing gears. The pump is immersed in oil and all oil drawn into it has to pass through a strainer at the bottom, which can be readily removed for cleaning. The pressure of the oil feed to the bearings is regulated by a relief valve. From the pump the oil passes through oil channels cored and drilled in the crankcase, to the main bearings, through the crankshaft to the crankpins and thence through tubes to the



Right side view of the W. S. M. engine

piston-pin bearings. Oil is also fed to the camshaft bearings under pressure and is delivered through a small hole in the end of the oil passage directly against the side of the camshaft gear. As the gear revolves, the oil is thrown off through holes in its face and automatically floods the faces of all gears in oil.

The oil is forced to the top of the engine and passes to the rocker arms through the central hole in the rocker arm shaft. Thence it passes through the rocker arm to the push rod and, after flooding the push rod, returns to the oil sump to be strained again by a fine mesh gauze before re-entering the pump. There is no outside oil piping on the engine. The crankcase communicates through the governor housing with the inlet pipe, which communicating passage serves as a breather. With an effective air cleaner on the carbureter, therefore, no dust can get into the crankcase.

The engine here described is fitted with an S. A. E. No. 2 bell housing. The Wellman-Seaver-Morgan Co. is getting out a complete line of engines based on this same

Magneto for Use with Fuel Heater

IN attacking the heavy fuel problem, automotive engineers have developed several fuel-heating devices for obtaining better vaporization. In some cases an extra ignition spark in the heating chamber is required to start and maintain the partial combustion of the fuel.

When these devices first appeared it was common practice to use a series spark plug in the heating device, leading the spark from this plug to another in one of the cylinders. Thus one spark was required to do double duty. This plan did not work out entirely satisfactory.

In the Splitdorf-Aero magneto only the negative sparks are utilized for cylinder ignition, and it was, therefore, a simple matter to modify the standard four-cylinder magneto to produce four sparks per revolution instead of two, and to lead the four extra positive sparks through a fifth distributor terminal to the extra spark plug in the heating chamber. This magneto, known as Splitdorf-Aero Model 480, is now in production.

The Recording Traction Dynamometer and Its Method of Use

The output on useful work of a tractor is the power delivered at the draw-bar, and the measurement of this power is the most important test that can be made of a tractor. If the test is made with the tractor pulling a plow, information is obtained not only of the output of which the tractor is capable, but also of the power required under the particular conditions.

UP to the time the Hyatt recording dynamometer was developed no thoroughly satisfactory means of testing tractors for horsepower delivered at the draw-bar was available. In order to get the net output at the draw-bar, it was necessary to use some type of spring scale or recording spring dynamometer for measuring the pull in pounds and, to get the other factors, it was necessary to measure the distance traveled and make accurate observations on the actual running time consumed. With an adequate crew of men, close results could be obtained but there were so many chances for error that the method was not used to any great extent.

The Hyatt dynamometer is a one man apparatus, the various units having been arranged so that the required observations are automatically and simultaneously recorded on a single chart which may later be analyzed and results computed with very little possibility of error due to the human equation. This instrument is of the hydrostatic type consisting of two units; a pressure unit, which is used as a hitch between the plow and the tractor, and the recording instrument, which records the draw-bar pull, the distance traveled and the elapsed time.

The pressure unit is always hitched between the tractor and the load to be pulled. It consists of a bronze casting which contains a rubber bag, filled with a liquid, to which the pressure is applied by a piston having an area of 10 sq. in. The draw-bar pull is transmitted to the piston by a lever having three hitch points. This gives three different ratios of draw-bar pull to pressure. The three hitches permit the dynamometer to be used in testing tractors of widely differing powers; the direct or 1:1 hitch having a maximum capacity of 3000 lb., the 2:1 hitch, 6000 lb., and the 4:1 hitch, 12,000 lb. draw-bar pull.

The recording instrument is of special design, consisting principally of a Bristol recording pressure gage. It is con-

nected to the pressure unit by a flexible brass tube, which conveys the liquid under pressure from the rubber bag to the Bourdon spring which actuates the pen arm, thus recording the draw-bar pull on a chart mounted in the recording instrument. A needle valve, inserted in the pressure line, may be adjusted to control the flow of liquid and dampen excessive vibration of the pen.

The chart is divided into spaces by a series of concentric circles, over which the pen travels, recording the draw-bar pull. With the 1:1 hitch, each space represents a pull of 250 lb., with the 2:1 hitch, 500 lb., and with the 4:1 hitch, 1000 lb.

This chart is divided about its circumference into 50 equal parts, each representing a distance traveled of 100 ft., the full chart representing a run of 5000 ft.

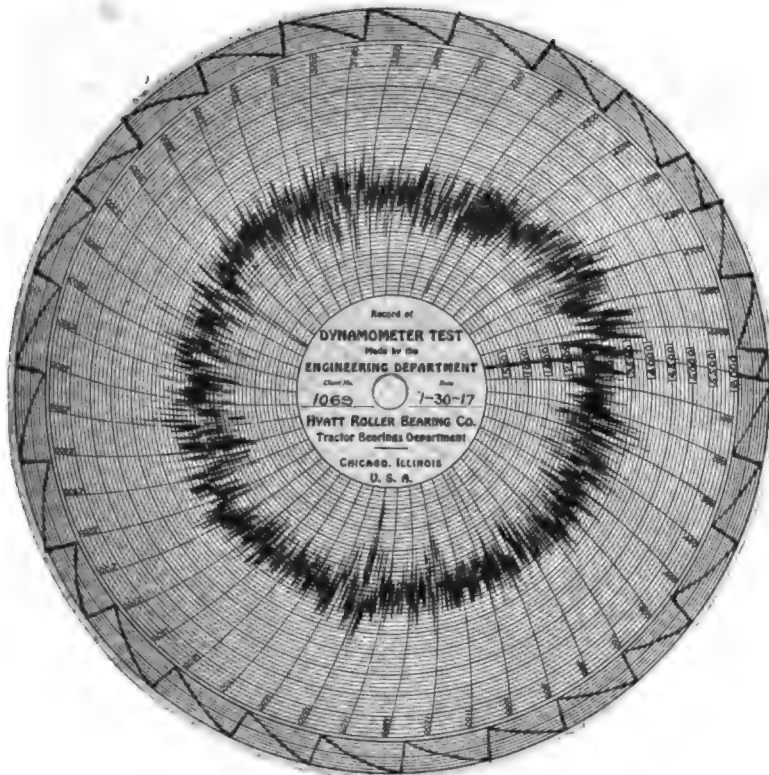
To record the distance traveled, a land wheel is attached to some convenient part of the tractor. The travel of this wheel is transmitted in the recording gage, which in turn rotates a shaft on which the chart is carried and causes the pressure to be recorded over a section of the chart corresponding to the distance traveled.

Another pen records the elapsed time on the annular space at the margin of the chart. This space is subdivided into ten smaller spaces, each representing six seconds of time. A clock in the recorder case, fitted with a special cam, trips the time pen at one minute intervals and the fractions of a minute may be estimated by counting the number of smaller spaces over which the pen has traveled.

The dynamometer chart tells the entire story of the test. From it are obtained all data for computing the final results. The heavy fluctuating line on the chart made by the pressure pen represents the actual draw-bar pull and an average of this is obtained by tracing the line with a radii averaging instrument. The average draw-bar pull may be divided by the number of plow bottoms, if the load



Recording unit of Hyatt dynamometer, consisting chiefly of a Bristol recording pressure gage



Sample draw-bar pull record made by Hyatt dynamometer

was a plow, giving the pounds of draft per bottom. From the line made by the time pen at the margin of the chart the distance traveled and time consumed are determined.

Having the average draw-bar pull time and distance, the average draw-bar horsepower may be determined by the formula:

$$\frac{\text{Av. Draw-bar Pull in Lb.} \times \text{Dist. Traveled in Ft.}}{\text{Elapsed Time in Minutes} \times 33,000} = \text{Av. D-b. Hp.}$$

Each full diagonal line made by the time pen at the margin of the chart represents one minute of travel, and the space between any two of the short radial lines at the margin indicates the distance traveled in the corresponding minute, provided the diagonal line is unbroken. If the diagonal line is broken, the space between the corresponding radial lines represents the distance traveled for a fraction of a minute, which may be determined by counting the number of small spaces over which the pen has moved in that time.

One of the most important items to be taken into consideration, to insure a satisfactory test of a tractor, is the condition of the soil. Best results are always obtained when plowing sod and where good traction is obtainable. It is also necessary to use the right kind of grouters for the existing soil conditions. The plows should receive

attention before a test run is attempted. They should be properly hitched and scour freely.

The tractor engine and tractor generally should also receive considerable attention, as follows:

- Valve timing and adjustment
- Timing of magneto
- Motor running at rated speed
- Carburetor adjustment
- Clutch adjustment
- Governor adjustment
- Clean spark plugs
- Good compression
- Proper heat for vaporizing fuel
- Proper fuel and lubricating oil.

To make certain that the test will do the tractor justice, sufficient load should be provided to develop its maximum sustained draw-bar pull at the rated speed. Plowing is always the most satisfactory method of testing the tractor and the load can easily be increased by sinking the plows to a greater depth. If this is not sufficient, a good plan is to add a series of disk harrows or ground pulverizers.

Weather and soil conditions may sometimes be such as to prevent plowing and then some other form of load must be substituted. A stone-boat is frequently used but it will be found more satisfactory to pull a dead tractor, the wheels of which can be locked if necessary to increase the resistance. Plowing, however, is the best test and will give the most satisfying results.

Using the Dynamometer

The use of the dynamometer in making scientific investigations of power farming problems from a technical standpoint has been wide. Much valuable information has been obtained in regard to soils and the effect of moisture on soils, the advantages of different type coulters, the comparative pull of disk and mouldboard plows, the effect of variations in depth and width of cut, of different speeds and hitches, the draft required for all kinds of farm machinery, etc.



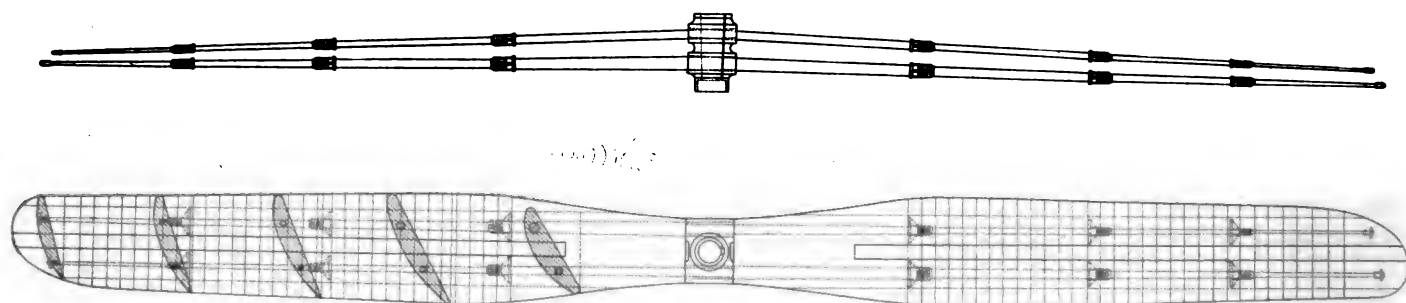
Hyatt dynamometer in use, illustrating its one-man feature

German Propeller Has Steel Core Rods with Wood Fillings

This new construction, worked out by a German engineer, has withstood rigid service tests for two years without change of profile or other deterioration, according to the claims made for it. The design is said to be especially suitable for use in tropical regions.

THE materials used for building propellers have been sheet steel and wood. Steel propellers are difficult to manufacture and have low efficiency, mainly on account of the great deformation of the blades when operating at high speed. Wood propellers are used on almost all airplanes, but they have serious drawbacks. The centrifugal force causes tremendous stresses and the reaction of

propeller shaft is threaded and only one large nut serves as a fastening. The two steel rods forming the core of each blade are tapered off toward the tips and their conical inner end is pressed in the hub without thread. The wood fillings are made of $\frac{3}{4}$ in. boards cut to the right shape and drilled with two holes for threading them over the steel rods, so forming the propeller blade. The outer



Haw propeller and its steel core

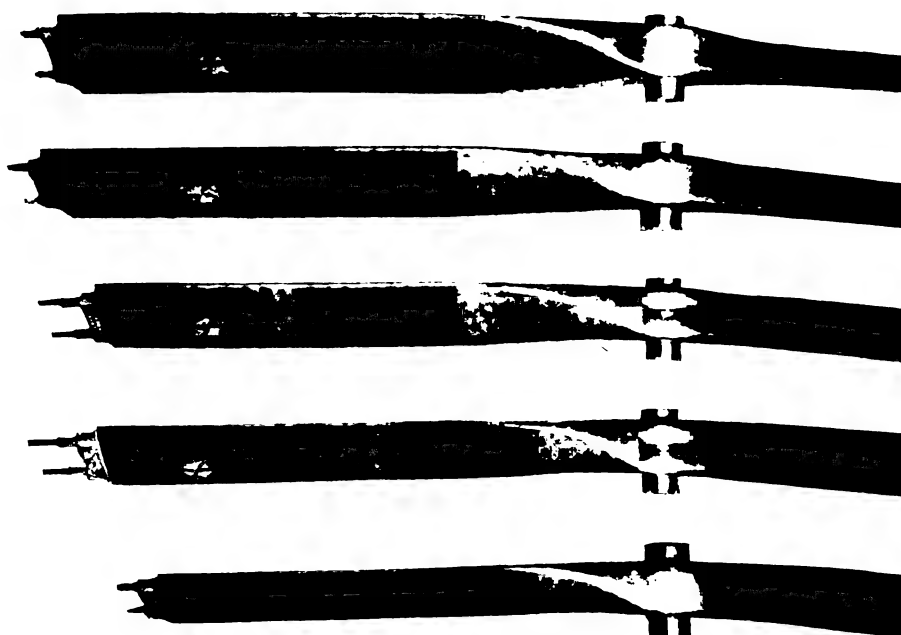
the air against the blades distorts them. All these forces have a detrimental effect on the structure of a wood propeller and shorten its life. A further drawback is the tendency to warp. It often happens that an airplane which stood in the hot sun all day and remained the following night in the cool shed, cannot rise on account of a warped propeller.

Moreover, the wood propeller requires a special hub with two circular flanges at the front and back side which are connected with screw-bolts passing right through the propeller wood. In dry weather, the whole propeller shrinks and, if the holding nuts are not screwed up in time, the propeller becomes quite loose, which has been the cause of serious accidents. On the other hand, if the nuts are screwed up tight after a long dry period and wet weather sets in, the propeller begins to swell, with the result that considerable stress is imposed on the wood. Consequently the propeller "flies off," or at least has lost its support in the hub, which causes further grave troubles.

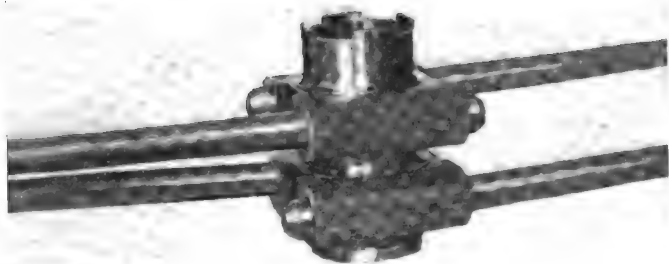
A German engineer, Haw, has invented and built a patented design of propeller having steel core rods and fillings of wood. The drawing shows a complete propeller and its steel core; the permanent hub is a steel part bored to a taper to fit the shaft. The tail end of the

ends of the steel rods are threaded, and flanged nuts are screwed on and secured by riveting over, these nuts serving to compress the wood fillings. An outer wood cap in two parts is glued on, so that the shape of the Haw propeller does not differ from that of the standard propeller.

After putting on the wood fillings, but before shaping



Some Haw propellers



Steel hub with core rods

the propeller blade, grooves are provided at the sides and entering edge, which results in a greater stiffness of the propeller. Each rod of the steel core is provided at intervals with nuts which serve as thrust pieces for taking up the centrifugal forces. The inner part of the propeller blade is a solid wood piece.

The chief advantages of this new construction are that the steel core takes up all stresses and that the steel hub is solid, that is, without the six or eight bolts otherwise

needed. Woods of which there is a plentiful supply can be used for the fillings, and the glueing need not be as carefully done as in regular wood propellers. Official tests made by the German Naval Board showed that the Haw propeller has a considerably longer life than the wood propeller and that no warping or twisting occurs. After two years of service under all conditions, there were no signs of deterioration or of changes of profile, and the view was expressed that "it was specially suitable for use in tropical regions." In spite of the smaller diameter of the test propellers, their efficiency was better than that of the best wood propellers. The weight of a Haw propeller is about the same as that of a wood propeller. Gunshots do only slight damage and do not incapacitate the propeller.

The same construction of propeller can be used as a fan brake. The working diameter of these brake propellers can be changed at will by removing or adding wood fillings. For endurance tests of aircraft engines, discarded airplane propellers were formerly used, and as the output of engines of the same type changes by 10 per cent, a number of brake propellers with different diameters must be kept in stock for testing. These brake propellers can also be used for testing automobile engines, but for this purpose they are built in a club form so that no axial thrust occurs.

Airship Engines

ENGINES for airships were dealt with from a design standpoint in a paper read by C. F. Abell before the British Royal Aeronautical Society. The paper was based on experience with engines fitted to British airships during the war, practically all of which were designed for use on airplanes, and the following are some of the conclusions reached and recommendations made:

The engine should have six cylinders in a single line, as this type gives greater accessibility, the exhaust piping is simpler, and the space available in a gondola of given size is greater than with a V-engine. The cylinders should be made separate and interchangeable, and the valves should be fitted in their heads and operated by overhead rockers and push rods from the camshafts. The top half of the crankcase should be provided with inspection doors on each side, to permit the big ends to be re-bedded without much difficulty; it should carry the camshafts, and the design should be such that the crankshaft journals are supported in it with bearing caps, and not in the lower half. The lower half should carry the oil pumps, but should otherwise be more or less an oil splasher. The lubrication should be on the "dry sump" system, with two drainage pumps, one at each end, in order to give efficient drainage when the ship is at a steep angle. Safety devices should be provided whereby either lack of oil pressure or excessive speed would at once stop the engine by cutting off the fuel supply at the jet.

For starting the suction pump starter, as fitted in the German airships is recommended. In it by simple mechanical means all the valves are lifted together about 3/32 in. from their seats, while the exhaust pipe is closed to the atmosphere and opened to a hand operated suction pump which draws air and gasoline from the carbureters into the cylinders. After a few strokes of this pump the valves are re-seated and the engine started by hand magneto.

The present fueling arrangements, which entail a good deal of manual labor, are unsatisfactory, being slow in operation, both in re-fueling and in trimming during flight, and definitely calling for extra men in the crew, who could

be dispensed with if a more automatic system were employed. It is therefore suggested that experiments should be carried out with propeller-driven pumps, several of which could be fitted along the keel or hinged arms that would enable them to be swung into the ship when not required. The question of using kerosene as a fuel should be investigated, since it would reduce the danger of fire and be cheaper. At present a 500 hp. kerosene engine would appear unduly heavy, but for future ships of, say, 10 million cu. ft. capacity, it might be practicable to employ much heavier machinery than is now possible.

IN a lecture on "Some Obscure Points in the Theory of the Internal Combustion Engine," given last month at a meeting of the Junior Institution of Engineers, Prof. F. W. Burstall said that to sum up the present position as regards the combustion of gases in a metallic envelope, the facts would appear to show that most of the phenomena connected with "after-burning" can be explained when the variation of the specific heat with temperature is taken into consideration, but there still remains doubt as to the correctness of the statement that combustion is complete at the point of maximum temperature. Without any desire to minimize the value of the experimental work which has been done on the internal combustion engine, he feels that nearly the whole of these researches labor under a most serious drawback from the point of view of the student of thermodynamics, namely, the number of variable quantities involved is so great that it becomes almost impossible to deduce any exact laws from a series of experiments.

THE Geological Survey has issued a report on the production of aluminum in 1919, in which it states that the value of the primary aluminum produced in the United States in 1919 was \$38,558,000, as compared with \$41,159,000 in 1918. This decrease was probably due to curtailment of production in 1919, forced by the accumulation of large stocks of aluminum by both Government and manufacturers in 1918.

The Correct Anchorage of the Cantilever Spring

This review of European practice has been prepared by Mr. Bourdon after a careful study of English models. His comments upon design and construction should interest American engineers and builders.

By M. W. Bourdon*

IT is said that the obvious is often overlooked and this would appear to have been true in the case of certain European designers when they first adopted cantilever springs. It, therefore, occurs that the same defect in design may be in evidence in some American applications of this form of rear suspension and, possibly, as is the case in England, be causing an unwarranted condemnation of the system as a whole.

The defect in question is in regard to the method of anchoring the rear ends of the springs to the axle. Several initial attempts to lay out the various parts exhibited little, if any, consideration of the effects of spring deflection. With an enclosed propeller shaft and the torque tube anchored rigidly at the front end, so far as lateral movement was concerned, the rear end of each spring was attached by a bolt through its eye, to a lug or bracket fixed to the axle casing.

It was assumed evidently that the lengthening of the normal distance between the centers A and B, Fig. 1, would be taken up by the pivoting of the spring center on its trunnion support and the movement of the front shackled end of the spring. Imagination only can suggest the initial effect on the parts concerned when spring deflection occurred; probably the springs each assumed a double S shape in side elevation when both were deflected equally. Even imagination may fail to give a hint as to where distortion occurred when only one spring was deflected or when one was deflected more than the other. The final effects varied. In more than one case, springs fractured; in some, the torque tube was torn away from the front of the axle casing, and in others the trunnion bearing brackets at the spring centers were distorted and the spring clip bolts bent after a run on unusually bad road surfaces. In all cases, the suspension was harsh; there was a pronounced feeling on the part of the passengers that something, some part of the chassis, was not "happy," while the driver was worried by the occasionally erratic behavior of the steering control.

This question cropped up during one or two confidential discussions with officials of designing and experimental departments during the Olympia Show last November and, as a result, the various methods of anchoring cantilever springs, as exemplified on the cars exhibited, were carefully inspected. Where they were at hand, members of the technical staffs were interrogated on the point and, in a surprising number of cases, it was admitted that the defect had originally occurred in new designs. Were this not so, one would have imagined that no designer could overlook the fact that, with a torque tube head capable of no movement except that about a transverse or longitudinal

axis, or both, the rear ends of cantilever springs must either be shackled to their anchorage or have sliding supports.

But this lack of consideration as to the effects of spring deflection has occurred not only in connection with the cantilever type. Certain ambulance cars and medium capacity trucks used in France by the British Army had semi-elliptic springs that were anchored by an eye-bolt to a frame bracket at one end, the other end being shackled. A torque rod was used, bolted directly to the axle casing at the rear and supported at its forward end by a link which did not allow lateral movement. When one spring was deflected more than the other, the axle assumed a position "out of square" with the chassis and endless trouble occurred, either by the torque rod working loose on the studs securing it to the axle or by the studs loosening in the axle case. If neither of these defects developed, the rod itself fractured.

The trouble was overcome by one of two methods: (1) a link with a ball joint at each end was fitted to support the front of the rod, or (2) the rear attachment was displaced by one consisting of a hinge with a vertical axis.

The Napier company, in its post-war chassis, which has cantilever springs secured to the axle by fixed brackets and eye-bolts, has adopted the plan of supporting the forked front end of the torque tube by a pair of ball-jointed links, (Figs. 2 and 3), that end of the propeller shaft having plenty of clearance within the casing to enable relative movement to occur between the two. It is quite an "eye-opener" to ride in the back of this car with the floor-boards removed and to watch the movements of the torque tube. The extent and frequency of the lateral and longitudinal movement provide clear evidence that, with the same type of spring anchorage and no similar provision for deflection, abnormal stresses must be imposed upon the springs, axle casing, trunnion brackets and even the frame itself.

The accompanying outline sketches, Figs. 3 to 10, are the issue of the previously mentioned inspection of cantilever spring anchorages on chassis at the Olympia Show. Several of the systems thus illustrated in purely diagrammatic form found several adherents and, naturally, variations in the different principles occurred in individual cases.

It will be seen that the only example illustrated of apparent lack of consideration for spring deflection occurs in Fig. 4, a French car. Here, however, the plunging motion of the propeller shaft within the rear half of the universal joint allows for the lengthening of the distance between the joint and axle centers when both springs are deflected to the same extent. But no provision for unequal deflection would appear to have been embodied and yet freedom for the front end of the torque tube to move lat-

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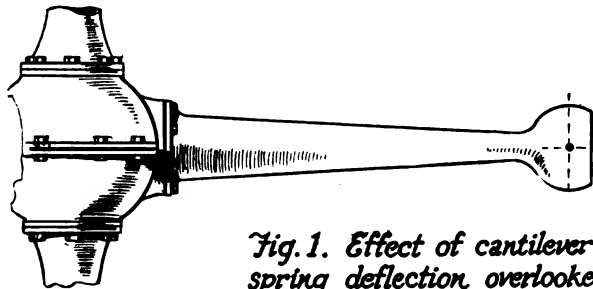
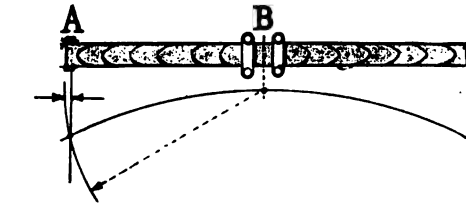


Fig. 1. Effect of cantilever spring deflection overlooked by certain designers.

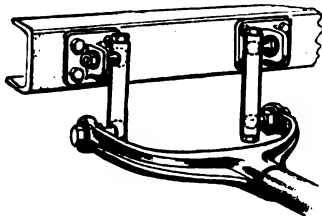


Fig. 2. Ball-ended link suspension of the forked end of torque tube on Napier

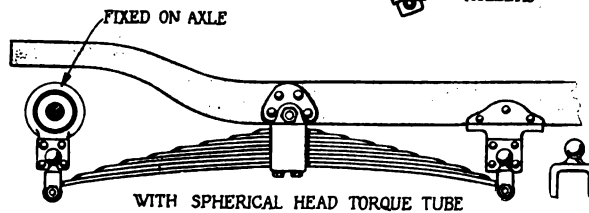


Fig. 8. Ball-ended shackles on the Lorraine Dietrich

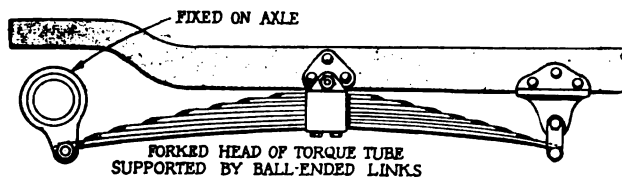


Fig. 3. The lack of rear shackles is countered by the ball-ended links of the torque tube anchorage

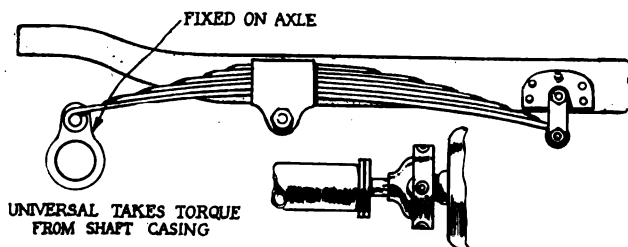


Fig. 4. Design making no allowance for unequal spring deflection.

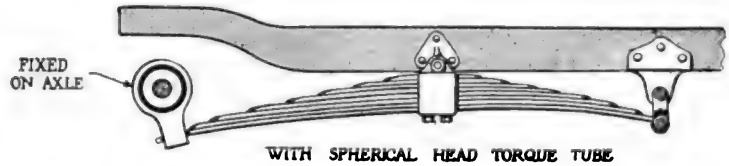


Fig. 5. Sliding support at rear end, shackles at front, exemplified on Armstrong-Siddeley in which height of front pin is adjustable in shackle plates to bring frame horizontal

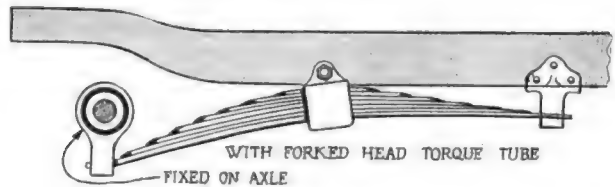


Fig. 6. Sliding supports, front and rear

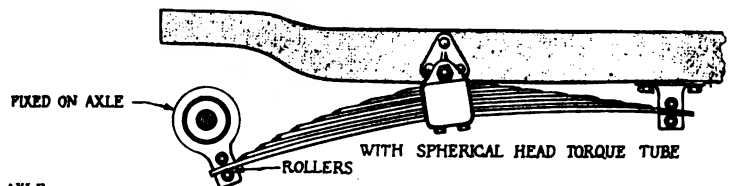


Fig. 7. Roller supports enclosed in grease retaining housings on Lanchester

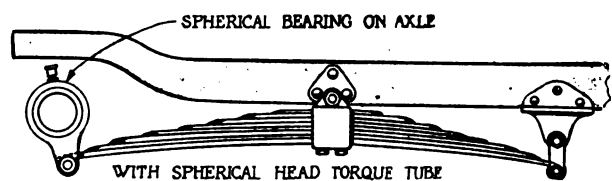


Fig. 9. Ring bracket at rear end with spherical bearing on axle casing on the Charron.

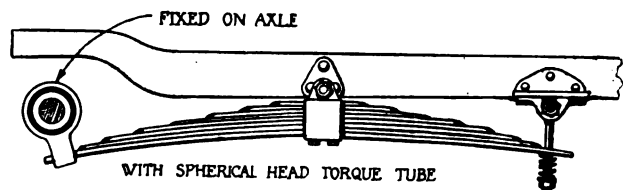


Fig. 10. Sliding support at rear, anchorage at front with adjustable supplementary spring to absorb minor shocks.

erally is apparently quite as desirable as in the case of the Napier.

In regard to the remaining diagrams, they are almost self explanatory. The designs shown in Figs. 5 and 6 are, however, in their application, lacking in means for lubricating the plain sliding bearings of the spring ends. This seems to be an unfortunate omission for, in connection with semi-elliptic springs similarly supported, the writer has encountered excessive wear of spring ends, necessitating the renewal of the main leaves in less than 10,000 miles' running—to say nothing of squeaks, rattles and hammerings. The latter can become pronounced under certain conditions of running, especially in cases where this type of sliding support consists merely of a platform or roller bearing for the spring end, without means of preventing the latter from "lifting." This omission occurs frequently, although the provision of rollers above and below, as in Fig. 7, presents no difficulty and an appreciable addition to the cost.

The Lanchester cantilever spring anchorages are on the lines of those indicated in Fig. 7. As a refinement the rollers are enclosed in a "box" slung below the axle, and the extension of each main leaf is subjected to constant lateral pressure against one side of the box by a stiff

helical spring, to prevent hammering due to side play.

Fig. 8 shows diagrammatically the unique ball-jointed shackles of the Lorraine-Dietrich spring. If one considers all the possible movements, relative and uniform, of axle and spring, one must admit that the universal movement allowed by the ball joints will occur under certain conditions. But provision to this end has apparently been considered unnecessary by any other manufacturer, although the Charron arrangement shown in Fig. 9 approximates the Lorraine-Dietrich so far as the rear ends of the springs are concerned. In this case, as the wording on the diagram conveys, the ring bracket is provided with a spherical bearing on the axle casing, the only instance of this arrangement the writer has encountered.

The demand for supplementary springs in connection with semi-elliptics is pronounced in England, their purpose being, of course, to absorb the smaller road shocks and to take up the initial portion of larger ones. The principle has been embodied in the final design illustrated in Fig. 10, but it would seem to be quite uncalled for, in fact, undesirable, in conjunction with cantilevers; even normally the latter demand a large scope for axle movement relative to the frame and are supple to excess in several instances within the writer's knowledge.

Monel Metal for Engine Valves

THE present-day aviation engine operates at much higher temperatures than were considered possible a few years ago. One of the greatest problems in the development of such engines has been the securing of a suitable material out of which to construct the valves. The life of ordinary valves is so short and their service so unsatisfactory that an improved material is urgently needed.

In a recent paper presented to the English Institution of Automobile Engineers, the merits of different steels for this service are discussed. No mention is made, however, of monel metal, a material which recent tests at the Bureau of Standards indicate to be deserving of serious consideration for this class of work. Exhaust valves of this material have given satisfactory performance in a 180-hp. Hispano-Suiza engine during 130 hr. of running time. Of this time the first 90 hr. were devoted to tests made primarily to study the behavior of the lubricating oils. The engine was operated for periods of about 6 hr. each, during which time it developed between 130 and 140 hp. at 1800 r.p.m.

Examination of these valves at the end of 45 hr. showed them to be badly pitted; they were ground just enough to reveal the condition of the valve seats and these, too, were found in the same condition, although no considerable drop in power had been noted. During the next 45 hr. the horsepower was substantially the same as during the first 45 hr., although a slight increase appeared during the first run following the replacement of the valves. The valves were then subjected to 40-hr. service under conditions far more severe than those encountered in normal operation. The engine was being used in connection with a study of preignition and for this purpose was operated at 1800 r.p.m. under full load for a period of from 4 to 20 min.

During the greater number of these runs preignition was intentionally produced, resulting in extremely high engine temperatures. An evidence of these high temperatures was furnished in one instance by the fusing of the nichrome electrode of a specially prepared spark plug, the electrode's melting point being 1500 deg. C. In fact, one of the evidences of preignition was that when the engine was shut down the exhaust valve in a cylinder that had been preigniting would remain red for nearly a minute

after the valves in the other cylinders had become black. In spite of the severity of these tests, there was no evidence of power drop from leaky valves. At the end of 130 hr. of running time the condition of the valves and valve seats appeared to be no worse than at the end of the first 45 hr. It would, therefore, seem that the pitted appearance which is a characteristic of this material has little effect on the gas tightness of the valve.

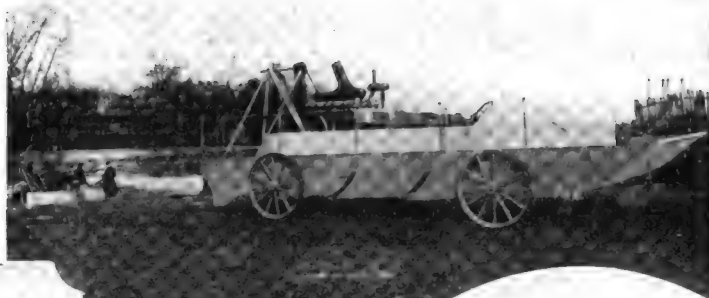
Quantities of Cotter Pins Used

IN the automotive industry, cotter pins are being used extensively and the market would appear to be widening. In the high priced cars, an average of 80 pins is a low limit and taking this as an average, an annual production of 2,300,000 cars would make a market for 184,000,000 pins. As the market is widely scattered, the method for distribution is one of the main points to be considered. Some form of container holding a limited number of assorted pins is convenient in supplying jobbers and repairmen.

Pins are frequently lost during the processes of repairs and the market opened up in this connection is not to be overlooked by any means, for the possibilities loom large. It is more economical to use a new pin than to search for an old one. That point particularly should be kept in mind when analyzing the market. The psychology of the lost cotter pin and the lost collar button are similar and the temptation to replace the pin is heightened by having a supply at hand. The market for replacements on the 7,523,664 cars and trucks registered on Jan. 1, 1920, is an extensive one and is remunerative to those who know how to reach it.

Some of the parts with which cotter pins are frequently used are the following: 1 pin with the drive shaft pinion nut, 2 pins with the starter spring shaft, 2 with the inner brake band guide, 4 with the outer brake band, 6 with the outer brake band support spring, 2 with the steering knuckle pin nut, 2 with the tie rod bolt, 2 with the foot brake rod yoke clevis pin, 1 with the hand brake band lever stud washer, 8 with the foot and hand brake rod clevis pin and 1 with the steering arm bolt.

Air Propelled Motor Boats of French Construction



The De Lambert glider with Renault aviation engine and aerial propeller. Intended for passenger service on shallow waters, and will take part in the coming races at Monaco



The De Lambert glider, with Renault aviation engine and aerial propeller, traveling at speed on the Seine



Count De Lambert, first European pupil of the Wright brothers, on his passenger-carrying glider, driven by a Renault aviation engine



Desmijols boat with Sunbeam 450-hp. 12-cylinder airship engine which is claimed to have attained a speed of 74½ m.p.h. on the River Seine



Salmson star-type aviation engine used on De Lambert glider

Right—The De Lambert glider, with Salmson star-type aviation engine and aerial propeller, running at speed on the Seine. The boat has attained a speed of 52 m.p.h.



Above — The De Lambert glider, which has been designed for passenger service on shallow waters, is driven by a Salmson star-type aviation engine. The boat will take part in the Monaco cruise and races

The Design of a Laboratory for Carburetion Investigation

Many automotive plants in the United States are being equipped with research facilities such as are described in this article. Convenience of operation and the obtaining of accurate observations with the minimum duration of engine run are, of course, factors to be sought.

THE dynamometer laboratory at the plant of the Stewart-Warner Speedometer Corp. has been designed to afford the greatest possible conveniences in operation and to permit accurate observations with a minimum duration of run. These qualities are highly desirable in any laboratory, but they become of paramount importance in the conduct of such work as the investigation of the carburetion requirements of engines, for instance, where great numbers of runs must be made, each involving a large group of observations, before a complete picture can be plotted.

While one of the chief uses of the laboratory is the development of fittings of the Stewart heavy fuel system to engines, for manufacturers of engines and automotive apparatus, an unusual amount of research in carburetion has been carried out. This work is under the direction of P. S. Tice, designer of the Stewart heavy fuel system and lately in charge of the carburetion investigations that constituted a part of the war activities of the Bureau of Standards.

A Sprague cradle dynamometer generator of 75 hp. rating is employed, in conjunction with a standard Sprague control panel. The base for this unit, together with that for the engine, is set in concrete some few feet off center in a room, 17.5 x 35 ft. The exciter and its controls are mounted at the side of the generator. This arrangement minimizes lengths of leads and makes a compact grouping, with plenty of elbow room all around. The control panel, with the resistance grids a few feet away and directly behind, is located and connected by leads in overhead conduit, so that it is under the operator's hand and eye, without obstructing the passage around the central group.

The Cooling Water System

Slightly forward of the engine and on the wall close to the ceiling is mounted a 40-gal. water tank. It is provided with 1½-in. pipes to and from the engine, with a valve-controlled filling line and with a 1-in. overflow leading to a soil-pipe. The cover is soldered all around, the only vent being through the overflow. This arrangement keeps water vapor from the tank out of the room.

In the pipe from the bottom of the tank to the engine is located a gate valve. Also, at the level of the floor and under a removable board of the wooden operating platform is a pipe with a large cock valve connecting the engine supply pipe with the overflow line. Opening the cock just mentioned permits of draining the entire system or of draining the engine only, depending upon whether the gate valve is open or closed.

The filling line to the tank is provided with a branch running down along the wall, parallel with the engine supply and the overflow, to a thermostatic regulator

operated by vapor pressure changes in a bulb enclosed in a tee in the line returning water to the tank from the engine. Altering the weight hanging from the outer end of the thermostat lever alters the temperature of the jacket water and the action of the regulator maintains the set temperature. The arrangement of the water piping, like that of the electric lead conduits, leaves the side spaces unobstructed. Suspended from the ceiling is a 5-in. exhaust pipe with a dependent leg at the rear of the engine, to which connection is made through a large tee, with gate valve cut-out and flexible metal tubing.

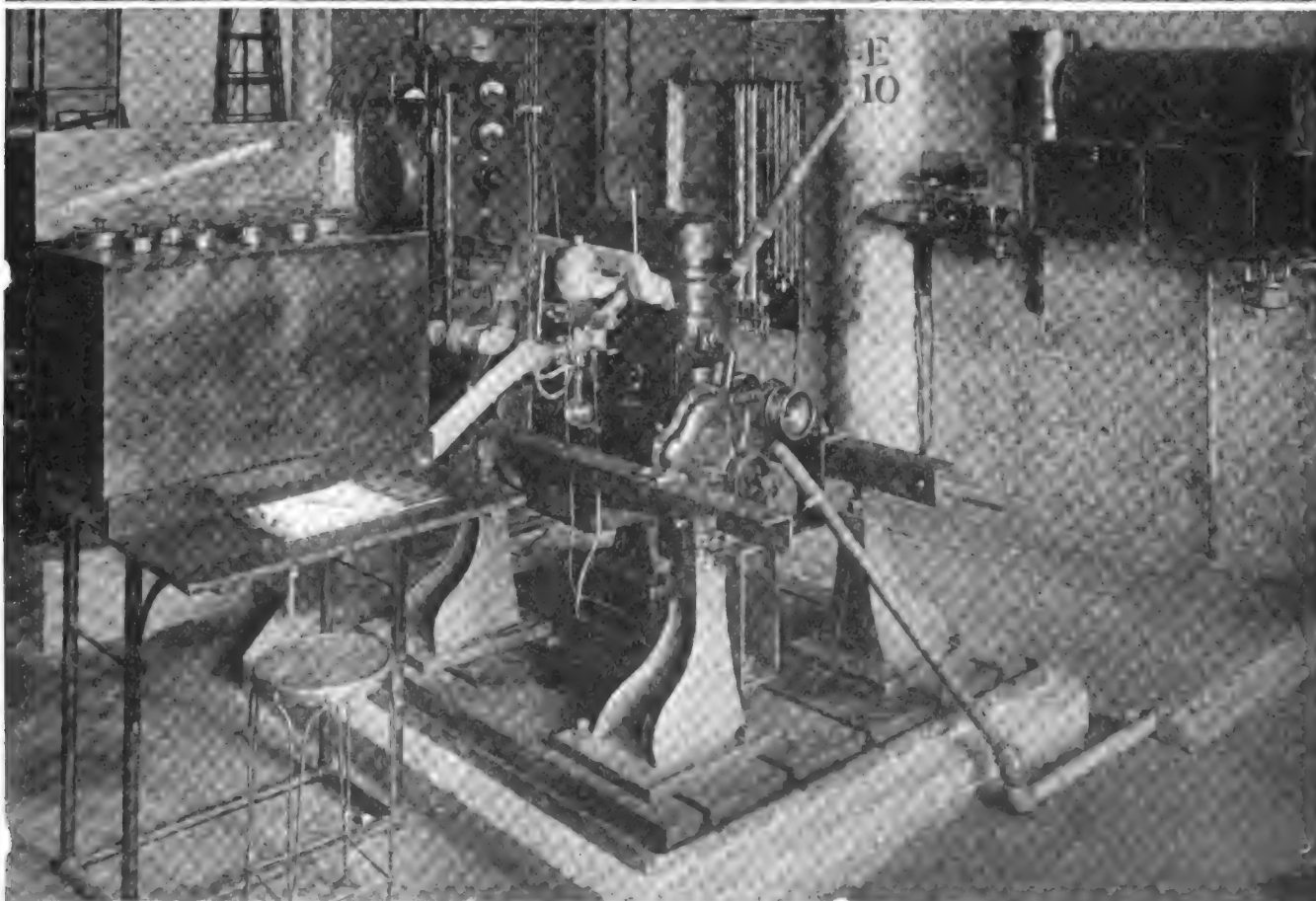
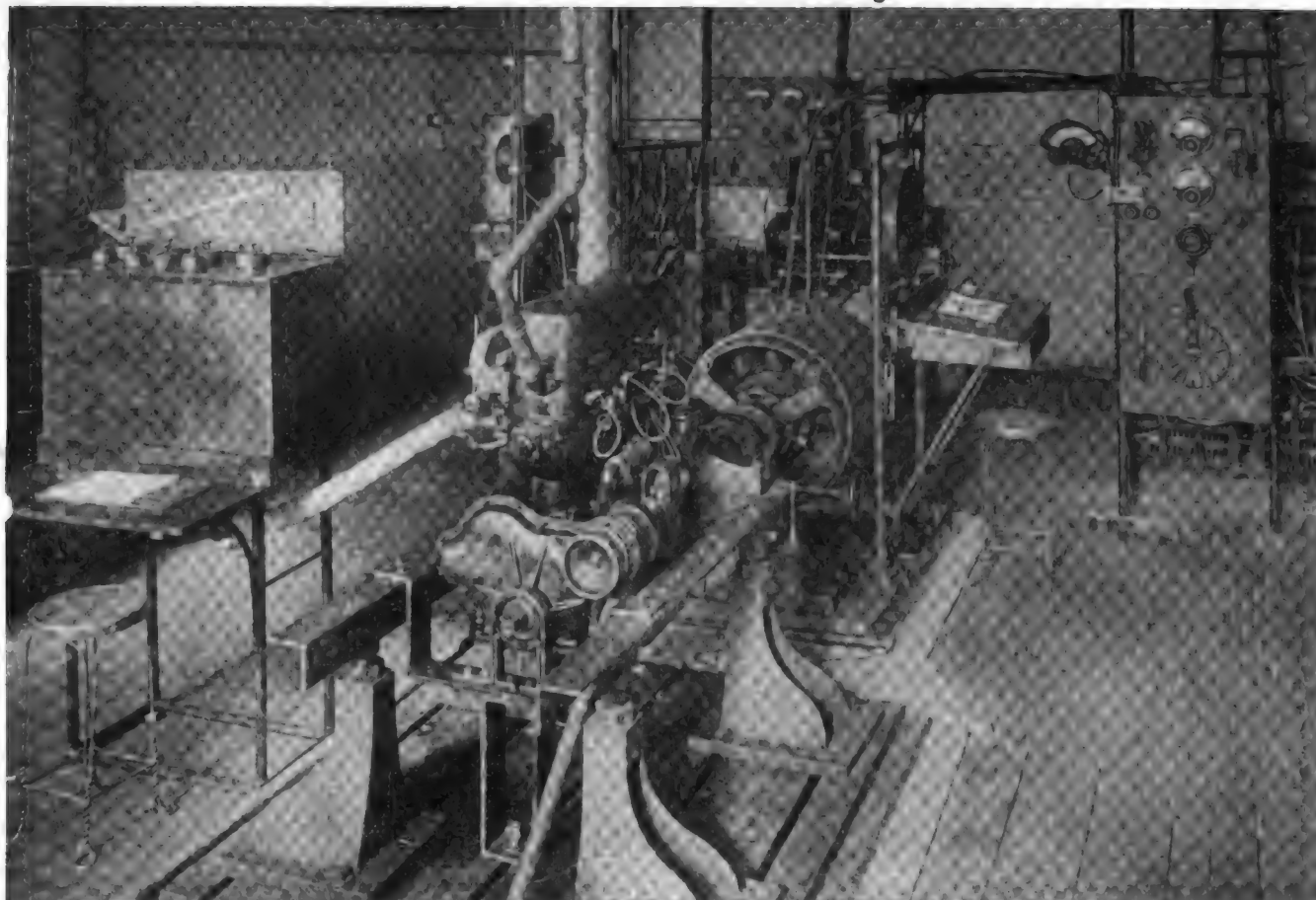
Bracketed upon the wall just above the thermostatic water regulator is a double shelving, upon the upper deck of which are mounted two fuel tanks. Each tank is provided with a needle valve discharging into a common outlet, so that the contents of one or the other may be fed to the engine at will. The smaller tank ordinarily contains gasoline and the larger a heavier fuel.

Starting the Run

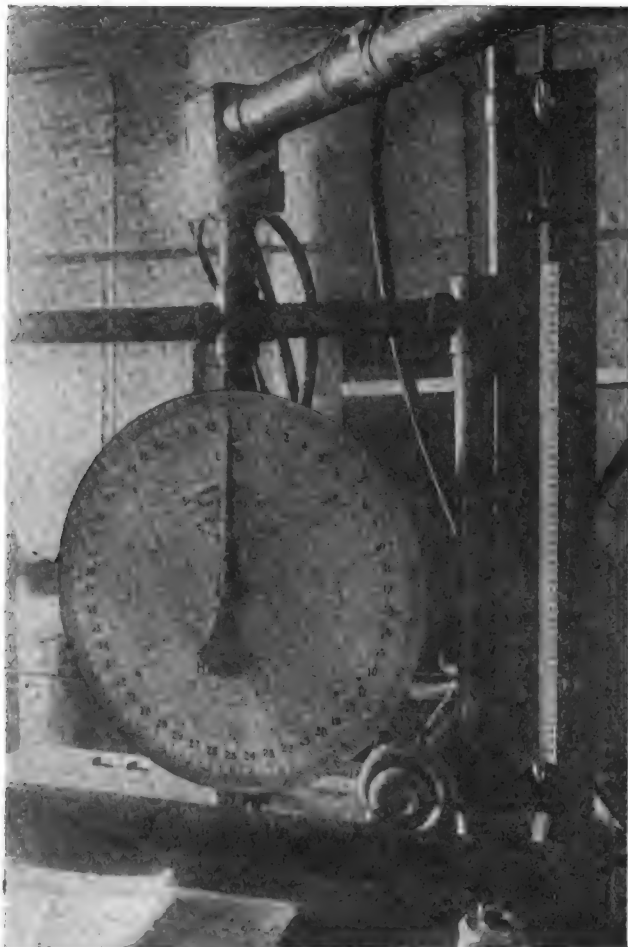
The common discharge pipe from the tanks passes through the lower shelf and connects with one end of the through passage of a three-way cock. The other end of this passage connects to the carburetor, by way of a line passing under the operating platform. The cross leg of the three-way cock is provided with a tube extending up through the shelf supporting the weighing scale and connects with the weighing tank by a rubber tube. The latter tank has a capacity of approximately 3 lb. of fuel and is provided with a combination vent, standpipe and tank gage of ¼-in. glass tubing, extending well above the tops of the supply tanks. The other pan of the trip balance carries a tare weight of such value that the tank pan swings down when the tank is filled with fuel.

Secured to the weighing shelf, with the scale, is a pair of mercury cups, into which dips a forked contact piece when the beam comes into equilibrium. This action completes a battery circuit through the windings of the stop-watch actuator (shown at the right of the balance), the revolution counter solenoid (shown on the dynamometer control panel), and an annunciator mounted under the weighing shelf.

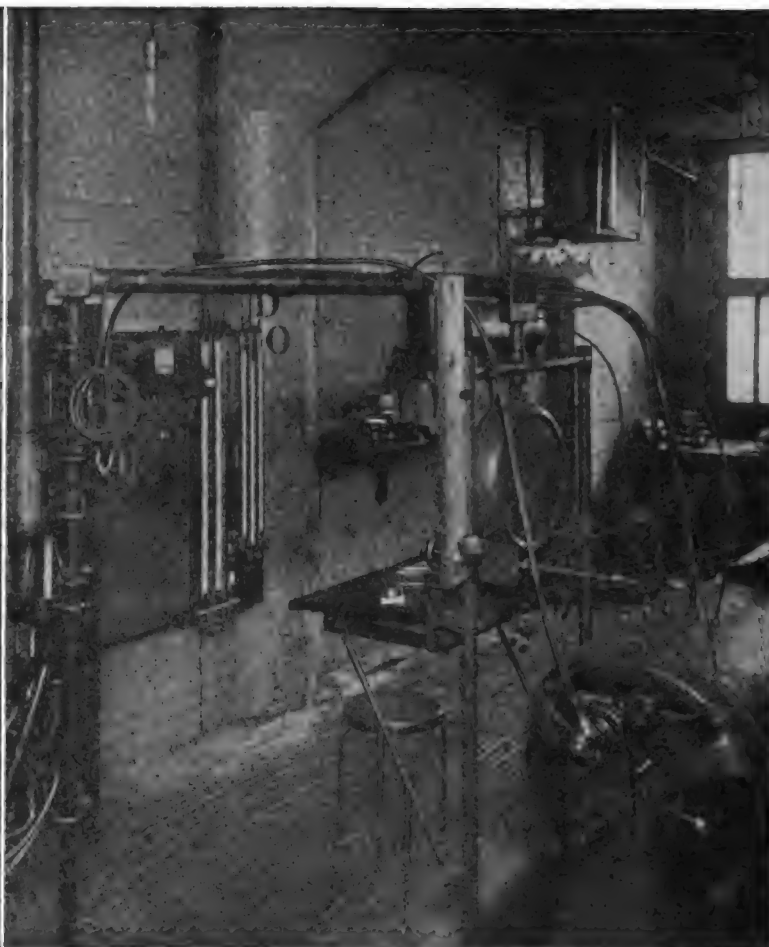
Having set the conditions of a run, which setting is made with all three legs of the three-way fuel cock open, the run is started by turning the fuel cock to communicate only the weighing tank with the carburetor. As fuel is taken by the engine the balance comes into equilibrium, closing the circuit through the watch and counter controls and the annunciator, starting the first two. A weight is then set upon the top of the weighing tank, returning it to its former position and breaking the circuit. When the engine has consumed an amount of fuel



Two general views of the Stewart-Warner test plant



Spring scale of Sprague dynamometer



Grouping of apparatus for convenience in making observations

equal to the weight placed on the tank, the balance again swings, closing the circuit, stopping both watch and counter and sounding the annunciator. Shifting the cock back to the all open position breaks the circuit by refilling the tank. After recording the time and revolutions the watch and counter are reset—the former by an electric push button in the watch mounting and the latter by a reset knob. Removal of the run weight from the weighing tank leaves this portion of the apparatus set for the next run.

The counter drive and controls are simple. A speedometer drive shaft with a swivel joint mounted on the chain guard at the rear of the generator drives a 10 to 1 worm and wheel. The counter spindle is provided with a spindled collar constituting one member of a positive clutch, a pin in the face of the collar engaging with a star wheel on the worm spindle. The collar is shifted by a fork secured to a sliding rod, the latter being linked by a connecting rod to an eccentric. The solenoid plunger has a rack secured to it, meshing with a small pinion engaging a ratchet wheel on the eccentric spindle through a pawl. A full stroke of the plunger turns the pinion and eccentric through a half revolution, thereby engaging the counter on one stroke and disengaging it on the next.

The apparatus employed in measuring the air flow consists of a large box made of wood and sheathed in galvanized iron, with all joints securely soldered to prevent air leakage. The top wall of the box has secured to it, by screws and soldering, a set of eight circular plates, each having an orifice formed in it. Closure of the orifices not in use is effected by large iron weights, formed

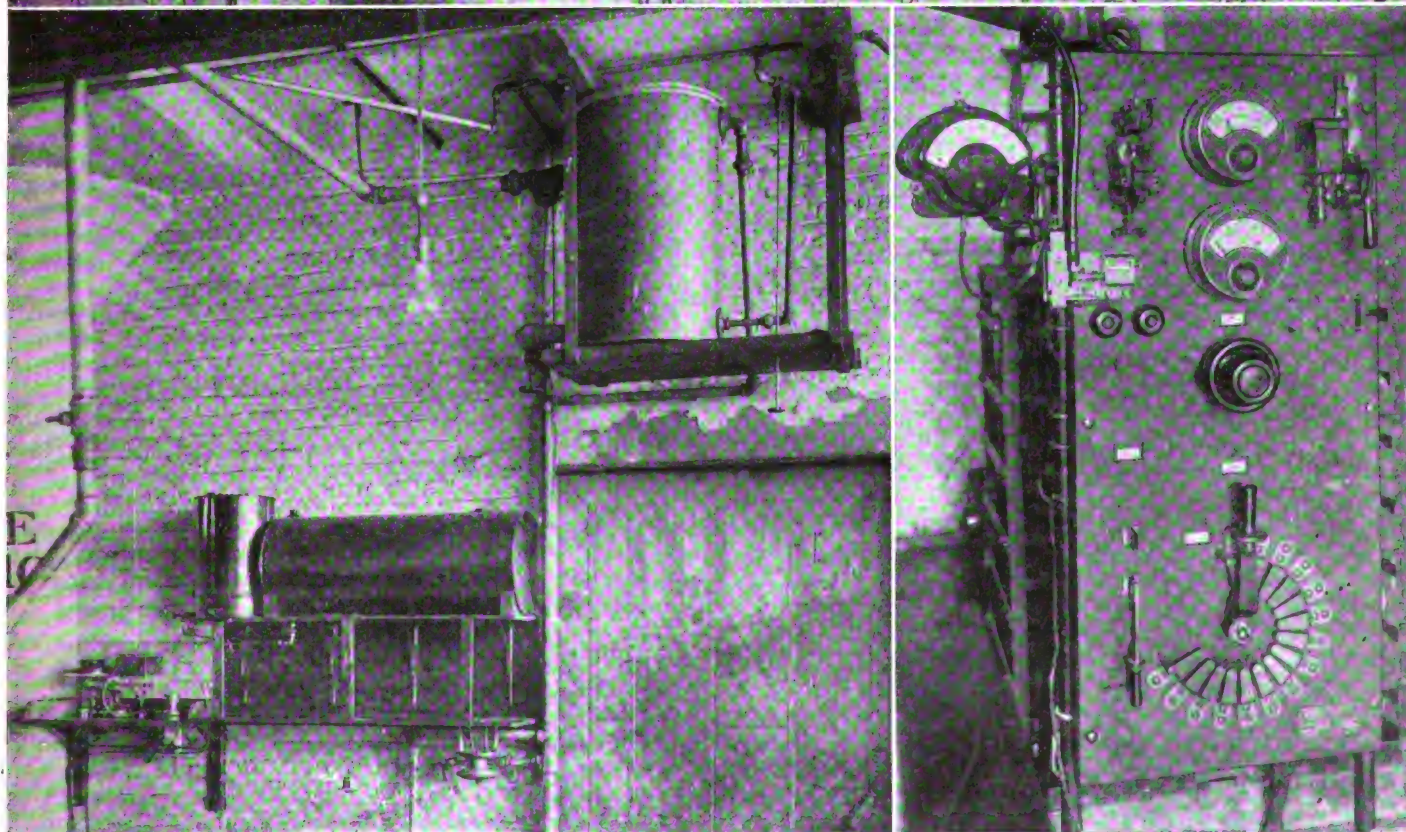
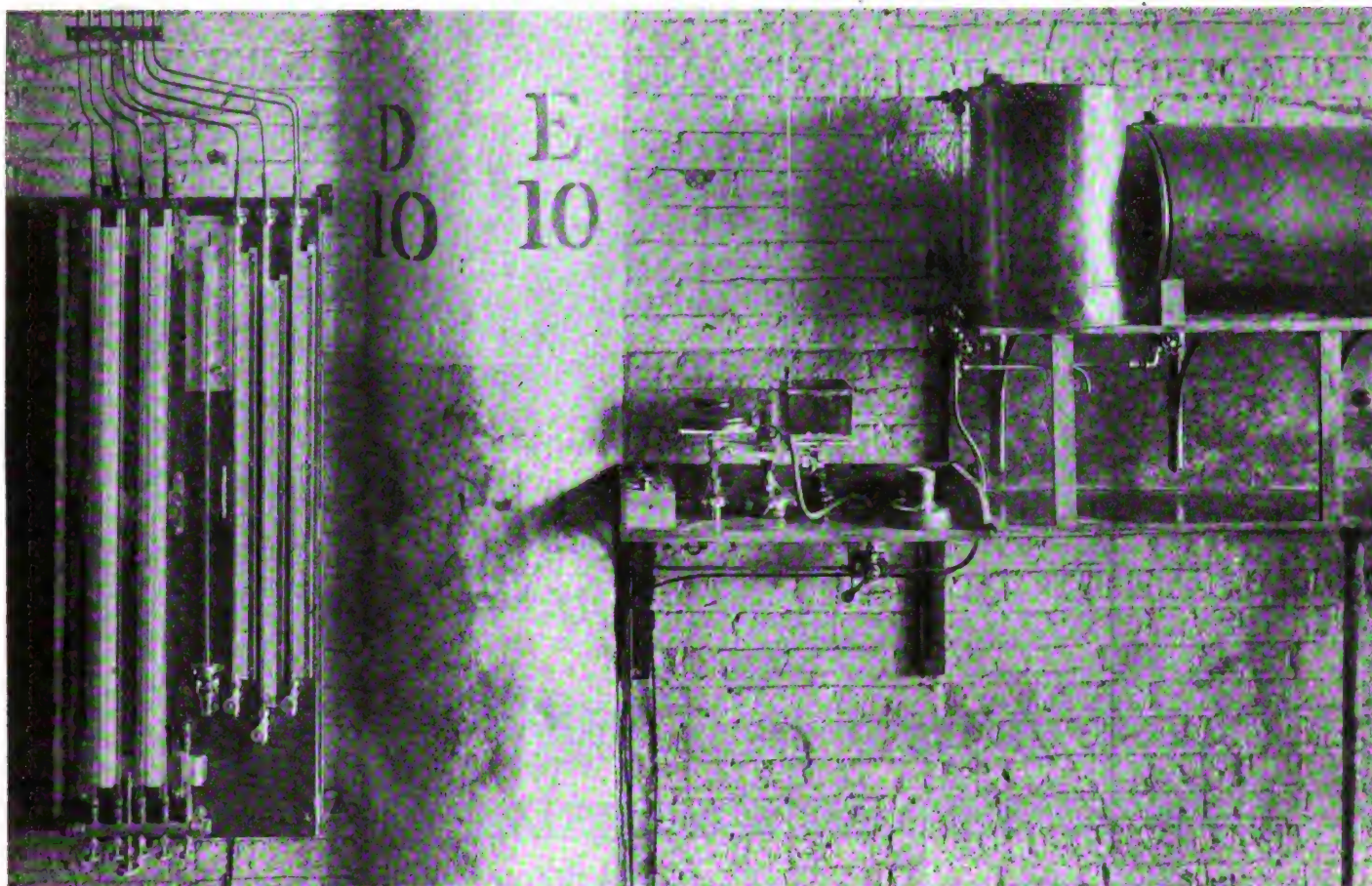
with loose fitting pilots and provided with pure gum rubber gaskets having 1/16-in. square section. The pressure on the gasket is sufficient to compress them considerably. This, together with the fact that they are kept moistened with glycerine, insures air-tightness.

A 3-in. pipe elbow, with a well-packed union to permit of swiveling, provides an air outlet at the bottom of the box. A tire tube, securely ligatured at the ends and fitted inside with a coil of spring wire, serves as an air conduit to the carbureter.

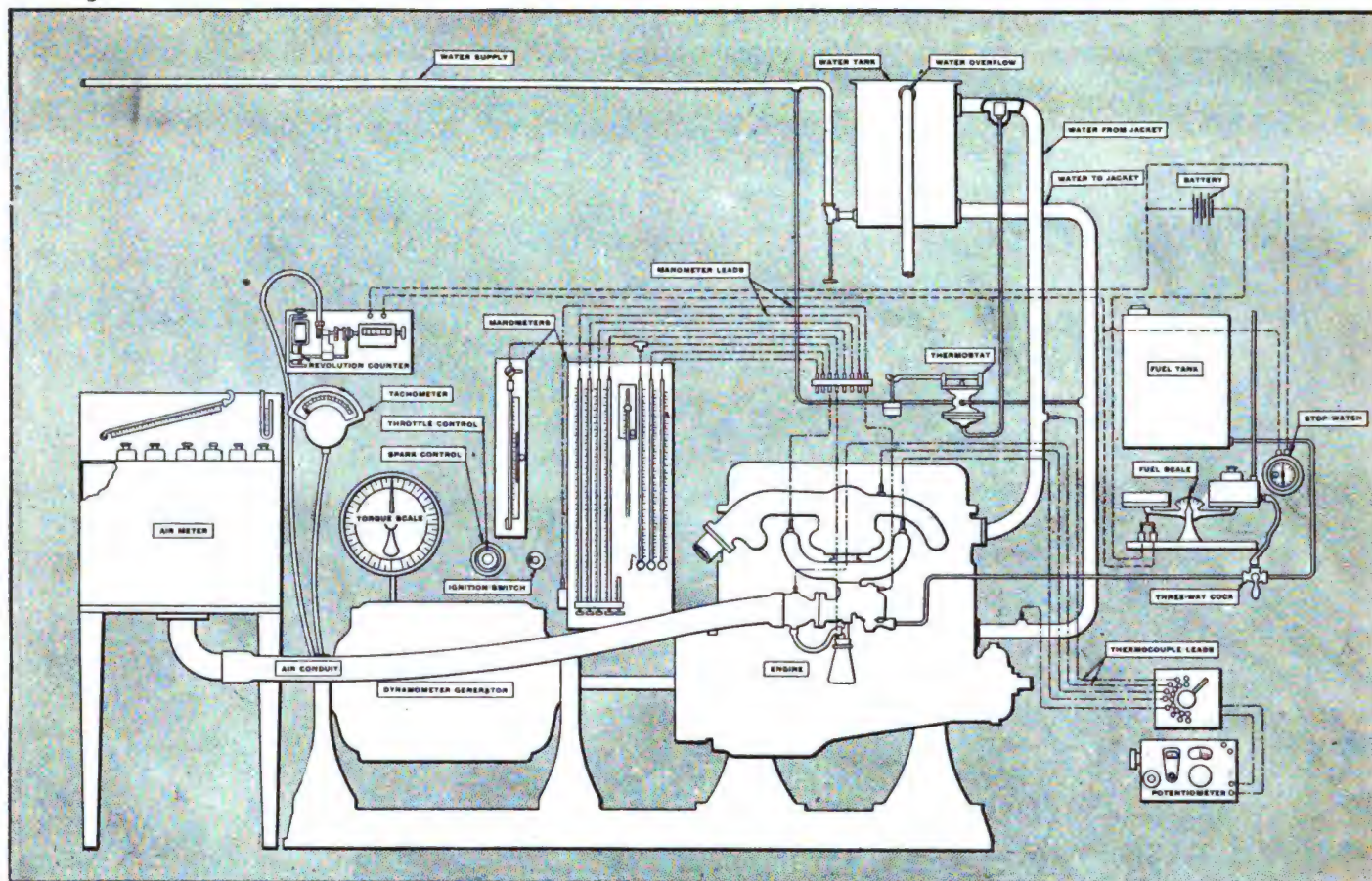
The pressure drop across the orifice is read on the inclined water column mounted above the box on a board fitted with a level and an adjustment for level. A total vertical deflection of 5 in. is provided in this manometer, the scale of which is 50 cm. long. Thus, a millimeter on the scale is equal to one one-hundredth inch of vertical water column. In setting up the manometer the angle of the tube was adjusted, with the level reading level, so that no correction need be made in the reading. The lower end of the tube connects with a small tank on the back of the board.

To use the meter it is only necessary to check the leveling of the board and have the zero of the scale at the zero water level with no air flowing, then using such an orifice that the water column stays on the scale. To change the orifices one merely removes the weight from the next smaller or the next larger, as required, and covers the one that has become unsuited.

In size the orifices range from 3.500 in. to 0.500 in. by 0.500 in. decrements, with an additional one of 0.3125 in. They follow the specifications laid down by Durley in his classic researches on air flow through sharp-edged



Above—Manometer board, fuel weighing scale shelf, stop watch actuator, fuel tanks, etc. Below; left—Water tank under ceiling, fuel tank on wall, thermostatic water regulator, fuel weighing scale, stop watch actuator, etc.. Right—Switchboard



Diagrammatic layout of plant

orifices in thin plates, both as to the plates themselves and as to their surroundings.

All temperature readings are made with a Leeds & Northrup automatically compensated potentiometer having the scales calibrated to read degrees Fahrenheit direct. For temperatures below 400 deg. Fahr. copper-constantin couples are used, and for the range 400-2000 deg. (exhaust temperatures) iron-constantin couples are employed. All the couples lead to a rotary selector switch connected with the indicating instrument, making it possible to record observations with great rapidity.

Combined with the driving mechanism of the optical indicator is a phase-changing drive for the stroboscope employed in making observations of the interior of the intake manifold, and also a spark timing indicator. The latter consists of a stationary (but adjustable) ring graduated in single degrees. Revolving within the ring is a pointer driven at crank speed. The gap between the pointer end and the inner graduated periphery of the ring is sufficient to make the spark clearly visible. Both pointer and ring are insulated and their gap is placed in series with one of the spark plugs.

For the measurement of pressures at various points in the intake system a group of manometer columns is provided. These comprise four water columns capable of 1000 mm. variation and three mercury columns capable of 750 mm. variation, mounted together with a barometer on a supporting panel. All these manometer columns are of the single leg variety, with wells at the back of the panel. In the case of the mercury columns the wells have 200 times the cross sectional area of the tubes, thus giving direct readings one-half of one per cent too small. Each is provided with a needle valve for the purpose of damping out oscillations of the columns.

The water columns all connect to a common header

or manifold which is in free communication with a tank on the back of the panel. This tank runs clear across the panel and has an area equal to 400 times that of one of the tubes. To make possible exact direct readings, the tank is provided with a gage glass and both double scales are mounted together on sliding plates so that they may be adjusted by a screw to keep the scale zero at the level in the tank. Each water column is fitted with an independent needle valve. The barometer is a simple type with adjustable cistern.

Each column is provided with a lead of $\frac{1}{4}$ -in. copper tubing running to the ceiling, across to a position just above the engine and down to a plate support. Here the required connections are completed with lengths of tubing and rubber nipples with ligatures. An extra lead runs from the plate above the engine to the back of the manometer panel, for the purpose of applying a plus pressure, if desired, to the well of one or the other of the mercury columns, or for connection to a well for the purpose of reading directly the difference in pressure between two points, neither of which is at atmospheric pressure. It should be noted that by the use of T's or Y's the columns can be connected at the engine ends of their lines in any combination desired. For instance, a water column and a mercury column may be connected together and readings made on the former up to the limit of the capacity of the column, when its needle valve is closed and observations are continued on the mercury column.

In much of the work that has been done in this laboratory it is necessary to set the intake manifold pressure at definite absolute values. To accomplish this and to have the reading directly under the eye of the operator—as much so as the tachometer—an additional mercury manometer is mounted on the torque scale supporting

frame. This column also has a well, duplicating the others noted, and connects permanently through a tee with a column on the panel used to indicate manifold pressure drop. In the case of this controlling manometer the scale is inverted and is fitted with a rack and pinion so that it can be readily adjusted.

At the start of a group of runs the barometer is read and recorded and the scale of the control manometer adjusted so that the barometer reading is at the zero level of the mercury. The reading of the control manometer is then the absolute value of the manifold pressure. Should the barometer reading change during a set of runs the control column can be let down by manipulation of its glass three-way cock and its scale reset to the true value.

All of the manometer scales are beveled, so that the graduations lie in part back of the tubes. This greatly facilitates reading, particularly in the cases of the water columns.

Standing facing the torque scale, the operator has before him the control manometer as discussed, the ignition switch, and the throttle and spark controls. On his right, within direct line of sight, are the tachometer and revolution counter, and at his hand the speed control. In arriving at a setting the throttle is conveniently manipulated by one hand while the other adjusts the speed.

Flexible braided wire belts are used for the remote spark and throttle controls. These controls are extremely

flexible in installation, are easy running and are free from backlash. Pulleys may be used to take the wire around corners, but a short length of bent tube, well supported, is equally satisfactory. Any ratio desired between the controlling spindles is easily secured by varying the pulley diameters. The control is made positive in both directions by notching a side wall of each pulley groove in two places close together and running the wire out of and back into the groove. Turnbuckles keep the wires taut.

In the special case where the throttle must be set with extreme delicacy, as in adjusting to a setting of a definite manifold pressure at a definite engine speed, simple sharp V-grooved pulleys are used in the throttle control, the controlled pulley being mounted on the spindle of a worm meshing with a worm wheel secured to the throttle spindle. In the set-up employed in this work the throttle controlling spindle is required to make 12.5 revolutions between the fully closed and fully open positions of the throttle. So delicate is this control that one can alter the torque by definite increments of 0.05 lb. as desired.

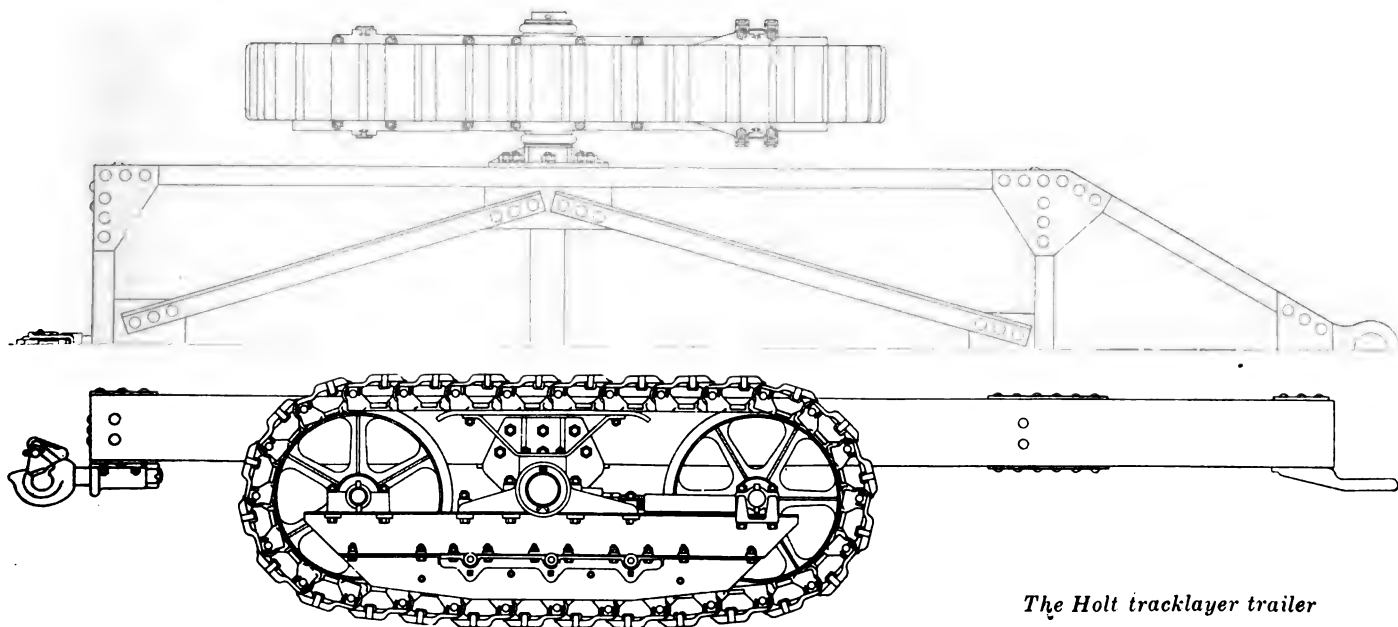
Centralization of the controls, grouping of units and the semi-automatic nature of a number of the observations make it possible for two men to handle comfortably the most involved set of observations that it is required to make. At the same time it is not unusual for two men to complete a group of 80 to 100 such runs in the course of a day's work.

A Tracklayer Trailer

DURING the war the tracklayer tractor industry received a great impetus, owing to the extensive use of this type of tractor for hauling heavy artillery and for other purposes. Since the armistice much use has been found for this form of tractor in industrial fields, especially in the oil fields and in logging. It has been found necessary, however, to develop trailers that can cope with the same ground conditions as the tractor itself. With the tracklayer type of tractor the ground pressure per unit of area is exceedingly low, and the tractor can be successfully used in very soft or muddy places where a loaded wheeled trailer will sink in to the hubs.

Owing to the boggy nature of the country, logging has been confined so far to the winter months, when the ground is frozen and covered with snow and ice. With tracklayer type tractors and trailers it is expected in the future to carry on the work all the year round.

We show herewith some drawings of a creeper trailer built by the Holt Mfg. Co. It consists of a frame supported by two bolsters on a stationary axle and of two track chains with their corresponding frames and guide wheels. The trailer has a capacity of 5 tons and weighs 3100 lb. The frame is built up of 8 in. steel channels and angle steel braces, and the axle measures 4 in. in diameter.



The Holt tracklayer trailer

The Utilization of Aluminum for Engine Cylinders

In view of the recent experiments and predictions in regard to air-cooled power plants, this article by Doctor Rosenhain, of the National Physical Laboratory, Teddington, England, becomes of unusual interest. The author will be remembered because of previous articles in this publication. It may be added, however, that he is an eminent student of metals.

By Dr. Walter Rosenhain, F. R. S.

THE use of the aluminum alloy piston in airplane engines has brought with it such important gains in regard to engine efficiency that it would seem a natural development to carry the same principle further. In that direction it is obvious that, if the thermal conductivity of the material constituting the cylinder walls of an internal-combustion engine could be considerably increased, a further raising of the compression ratio should be possible, or alternatively, larger cylinders could be used without lessening the efficiency of cooling.

It would, of course, be anticipated that this consideration would apply more forcibly to air-cooled than to water-cooled engines but the endeavor has been made to apply the principle to both types of aircraft engines and to some automobile engines also. It cannot, however, be said that the results have corresponded to anticipations for the increase in engine efficiency resulting from the application of aluminum alloys to cylinder construction has not been nearly so great as that which resulted from the introduction of the aluminum alloy piston. It would seem, therefore, that the problem of rightly utilizing aluminum alloys for cylinder purposes is not yet fully solved and, perhaps, it will be worth while to consider some of the factors on which any solution must depend.

There can be little doubt that the crux of the whole matter lies in the use of liners in aluminum cylinders. Although in experimental engines aluminum pistons have run successfully for a time on bare aluminum surfaces, no one has regarded such a construction as even reasonably reliable for practical purposes. The interior surface of aluminum alloy cylinders has, therefore, always been provided with a hard-wearing surface of iron or steel, generally in the form of a cylindrical liner placed within the aluminum alloy casting.

Many disadvantages, however, accrue with the use of such liners. There is, in the first place, the problem of construction. It is not possible, except with small cylinders, to cast the alloy around the liner, since the subsequent considerable thermal contraction of the aluminum, which is much greater than that of steel, either leads to the cracking of the casting during cooling or, at best, leaves it severely strained and liable to sudden failure in service. One of the methods which have been employed for inserting the liner into the finished casting consists in simply providing the outside of the liner and the inside of the aluminum jacket with a screw-thread of moderate fineness and then screwing the cold liner into the cold alloy jacket. An alternative, which is probably preferable, has been adopted in the well-known "B.R.-1" type of aircraft

engine, in which the aluminum alloy jacket is shrunk on the steel liner.

Of these two methods, the latter has a decided advantage, owing to the fact that, as the cylinder becomes heated in use, the aluminum casing expands to a much greater extent than the steel liner. If they have been a screwing fit when cold, quite a small rise of temperature will cause a slight gap between them. If the aluminum has been shrunk on, however, the first effect of internal heating will merely be to lessen the tension of the outer casing and only after a considerable rise of temperature will the casing expand out of contact with the liner. There can be no doubt, however, that there is a very definite absence of thermal continuity between the liner and the aluminum alloy casting and this will become increasingly evident the higher the temperature of the alloy jacket. When an engine is running, an equilibrium condition will be reached in which the liner is much hotter than the jacket—so much hotter, in fact, as to balance more or less completely the greater thermal expansion of the aluminum alloy and thereby to keep the liner pressed reasonably tight against the jacket. That this will occur is evident because, as soon as the liner cools a little below that temperature, the loss of thermal conductivity at the junction of steel and aluminum will rapidly increase and then the temperature of the liner will rise until contact is again attained.

From the point of view of engine efficiency, however, the temperature of the outer aluminum alloy jacket is of no importance; what matters is the temperature of the liner and it is doubtful whether this is much lower than that of the inner portion of an all-steel cylinder. It has been clearly shown, for instance, that such a device as coating the outside of a thin steel cylinder with electro-deposited copper, in the hope of obtaining increased cooling effect from this highly conducting outer layer, is ineffective in producing any material decrease in the temperature of the inner cylinder walls. In the case of the aluminum alloy jacket with a steel liner, however, one important advantage does remain, that is a considerable improvement in the uniformity of temperature distribution around the cylinders. In air-cooled cylinders, particularly in aircraft engines, the windward side receives much greater cooling from the air than the leeward side and in the case of iron cylinders, this causes differences of temperature leading to serious departure from a true circular section. The steel-lined aluminum alloy cylinder, however, thanks to the high thermal conductivity of the jacket, avoids this trouble almost entirely.

If we recognize the relative inefficiency of the aluminum

cylinder construction in which a steel liner is employed, it becomes desirable to consider possible alternatives. By far the best would undoubtedly be the development of an aluminum alloy—or of some other alloy combining the high thermal conductivity of aluminum with sufficient resistance to wear to allow of its use without the provision of any additional hard-wearing surface. As yet, it must be admitted that no such alloy has been found, and it is at least doubtful whether any aluminum alloy is likely to be found which could successfully withstand the combination of high pressures and high temperatures, together with the risk of occasional partial deficiency of lubrication to which the interior face of a cylinder is exposed. This is a matter which metallurgists will no doubt bear in mind in their future investigations of light alloys, but for the present, at all events, no such material is obtainable.

Aluminum Cylinder Heads

A second alternative, and one which is being widely adopted, is to admit the difficulty and our failure to surmount it, and to concentrate upon the use of aluminum alloys for the combustion heads of cylinders, which are not exposed to contact with the piston and in which, therefore, no liner or inner protecting surface is needed. For this purpose, aluminum alloys are now used to a considerable extent and the difficulty, originally anticipated, with regard to the attachment of steel valve-seats, appears to have been safely overcome in much the same way as the corresponding difficulty in regard to the piston pin bushes in pistons. But limitation to cylinder heads involves the abandonment of a great part of the possible value of aluminum cylinders in air-cooled engines, because not only is the cylinder head only a fraction of the total cylinder area, but the cylinder also loses the very considerable advantage in cooling effect which is gained with an all-aluminum cylinder by conduction to the crankcase, etc.

It would seem worth while, therefore, to consider any other possible modes of construction which offer prospects of avoiding the disadvantages of the steel liner. One possibility which suggests itself is the use of liners made of alloys having both a higher coefficient of thermal expansion and also a greater thermal conductivity than steel. The use of certain bronzes, and particularly of one of the alloys generally termed "aluminum bronzes" suggests itself. In regard to their thermal properties, some of these constitute a much nearer approach to the aluminum alloys than does steel.

Another possibility would appear to consist in providing the aluminum alloy cylinder casting with a hardened inner surface not necessarily of a continuous character. If the casting cracks owing to contraction when cast around a steel liner, this could be avoided by using a liner which has previously been split longitudinally in such a way as to allow it to be sprung inward by the contracting aluminum. This process might even be carried to the point where the "liner" consists of a series of steel strips embedded in the interior face of the cylinder casting. There is, however, the obvious difficulty that in such a construction there would be a tendency for the formation of minute erosion channels in the aluminum surfaces between the steel strips and these would lead to the serious escape of gas, loss of compression, etc. If the steel strips were further broken up, into a large number of irregularly shaped and closely packed fragments of steel so placed in the mold as to become embedded in the inner face of the cylinder casting, it is possible that the development of erosion and leakage channels might be checked, but although possible, this procedure offers considerable difficulties from the foundry point of view.

Another possible method of providing the interior wearing surface of an aluminum alloy cylinder with a hard

coating may be found in the electro-plating process. This process has recently found some startlingly useful applications of a character which had not previously been contemplated, particularly in connection with this very matter of wearing surfaces. For instance, worn steel shafts have been saved for further service by depositing upon the worn surfaces layers of electro-iron which have been found to possess sufficient strength and adhesion to afford a serviceable life for the repaired article. The use of electro-deposits made on aluminum alloy castings for repair purposes has also proved successful under war conditions.

The production of a hard internal coating on a cylinder casting by means of electro-deposition has actually been tried, and promise of highly successful results has been obtained. It is true that it is not the easiest of operations to secure a good electro-deposit on an aluminum alloy surface, even when copper is the metal deposited, but with care and skill it can be done quite satisfactorily. It is not easy to do this with pure aluminum, but the alloys ordinarily used for engine castings of this kind contain enough copper to facilitate the adhesion of electro-deposited metal. The question then arises what metal should be used to form the wearing surface of the cylinder. In order to obtain adequate hardness, it is probably desirable that either iron or nickel, or possibly an alloy of both, should be used. Owing to the considerable difference in thermal expansion between iron and an aluminum alloy, however, it is inadvisable to attempt to deposit the iron directly on the aluminum casting. By first covering the aluminum with a thin layer of electro-deposited copper, several advantages are gained. The copper has an intermediate rate of thermal expansion as compared with iron on the one side and aluminum alloy on the other, and its presence, therefore, will lessen the strains set up on heating; at the same time, the coating of the aluminum with copper will considerably facilitate the deposition of iron or nickel.

Terminated Further Advance

Following this procedure, eminently successful coatings, both of nickel and of iron, have been applied to aluminum cylinder castings, and these coatings have subsequently undergone the machining operations quite successfully. The whole development, however, took place at so late a stage that the termination of hostilities has arrested further advance, and results of any actual running trials are not available. The relatively very thin electro-deposited coating, however—provided that it proves strong enough to withstand the usage to which it is subjected in the engine—has certain very definite advantages over any separately introduced liner. One of these advantages is that it is much thinner than any liner can possibly be made, and, therefore, offers much less resistance to the passage of heat and sets up much smaller stresses as the result of thermal expansion. Another important point is that the electro-deposited metal, if it is made to adhere to the aluminum base sufficiently firmly to resist machining, etc., possesses a far better thermal and mechanical contact with aluminum than is the case with a mechanically introduced separate liner. This is probably the most important point of all, since it is the slight mechanical discontinuity at junction of liner and casting that really impairs the thermal efficiency of the whole cylinder.

What has been said above in regard to the problem of the aluminum alloy cylinder has direct reference mainly to air-cooled cylinders. It is, however, directly applicable to all those forms of water-cooled cylinders which are cast in such a manner that each barrel is formed by a complete aluminum cylinder into which a liner—in the more usual practice—is inserted.

The Use and Value of Wood in Building Bodies

Lumber and woods are becoming increasingly difficult to obtain, particularly certain timbers that have been used in large quantities. This article endeavors to show that the body builder has a wide range of woods and that rigid restrictions are not essential in keeping the quality high.

By George J. Mercer

THE use of wood for automobile body construction is confined to-day, except for a negligible number of custom built bodies, to what is designated as the body framing. The transition from bodies constructed entirely of wood, like the carriage, to what is called the composite body, composed of wood framing and metal panels, began at the earliest period of motor car use. Wood panels could not stand the punishment due to the increased speed, long continued use with its attendant abuses, the turning of corners at a high rate of speed and the tearing action of the top on touring bodies when up, due to the swinging action accentuated by wind pressure.

It might be asked why wood is used at all in body construction since it is conceded that metal is so much superior for the casing or outer shell. Ultimately metal will supersede wood for many of the framing pieces. Open bodies are being made in large numbers in which the use of wood is confined to floorboards and the sticks to which the trimming is nailed. The idea of making an all metal body is such an alluring proposition that from the very beginning of the industry there have been optimistic manufacturers who have attempted to market bodies so constructed. But considering passenger car bodies only, the attempt has not been financially successful until quite recently at least. The writer has in mind one manufacturer who was a pioneer in attempting to build the composite body.

The urge for an all metal body is augmented by the scarcity of available wood. The only possible substitute is metal. The composite pressed wood substitutes are suitable for roofs and panels but they have no value as framing. Not all woods are suitable; only good live hard stock may be used, and some of the pieces must be clear grain and free of knots and blemishes so as to have the requisite strength.

Substitution of Cheaper Wood

To substitute metal for parts of the framing is prohibitive for all but a few of the car manufacturers, on account of the high cost of dies. Then, too, most car manufacturers are affected by changes in body styles. Therefore, the manufacturer whose output is the result of an expensive tool equipment lacks the flexibility of the one who can make minor changes with less expense. Unquestionably, the line of least resistance is still the composite body and the substitution of cheaper wood for this purpose is the only available means of augmenting the supply.

The seriousness of the timber supply has brought about more intelligent and economical methods of utilizing the timber on hand as well as making it possible to use wood

heretofore not considered practical, such as red gum. Body manufacturers have their own kilns, they test all planks for moisture content and dry scientifically instead of following the haphazard methods formerly practised, thereby knowing exactly how the wood is going to act when machined. It is well understood that timber is variable and that its strength is not uniform in pieces belonging to the same species; therefore, intelligent care in handling in the kiln results in a big saving, as the use of selected stock is almost out of the question except for a few of the most important parts of the framing.

The Moisture in Wood

Every one knows that when cut, logs contain a large amount of moisture, sometimes more than the actual weight of the wood itself. From wood intended for body work all but about 8 per cent of this moisture must be removed; the wood is never wholly deprived of its moisture, as experience shows that it then becomes brittle and worthless. The wood gains in strength from 10 to 25 per cent with the moisture removed and machining operations are possible only with dry lumber, because the newly cut exposed parts of unseasoned lumber are dried out by the atmosphere and this causes them to twist.

To illustrate this, let us consider what is termed case hardened lumber. This term has the same meaning as when applied to steel but it does not have the same beneficial results. Lumber, when sawed into planks and stacked in the open, where the air circulates about it, eventually will become dry. If the planks are two or more inches in thickness, the time required to season properly would not be considered practical today. Therefore, it is put in the dry kiln and the process of years is accomplished in days. The planks, however, between the time they were rough-sawed and put in the kiln may have rested for quite a time in the air and the drying processes by nature may have progressed all over the outer surface with the result that the outer cells or fibers have become closer knit together, forming a casing around the inner part that remains nearly as full of moisture as when first cut.

This casing prevents the inner moisture from finding its way out easily. If the plank is put immediately into a dry hot kiln, the condition becomes aggravated. The outer casing is dry around the moist core and the plank when taken out after the customary heat seasoning, has a dual composition. When cut for machining, the newly exposed inner parts will dry by contact with the air and, as the outer part is already dry, the result is that the machined piece will change its shape and set quite different from the pattern by which it has been cut. Wood such as this is worthless; it will continue to change its shape as long as there

are unduly moist parts that will dry when exposed to the air. Losses of this kind are avoided by proper tests before the kiln operation and by giving the plank a bath of water or steam preliminary to the heat treatment, thereby restoring it to its primary condition where all the cells were uniform, the outer ones open to permit the inner moisture to escape.

Another method of conserving the wood supply consists of the use of machines that tongue, groove and glue together narrow pieces that formerly went to the refuse pile, into wide planks. It is customary to make planks from pieces not over 1 in. wide. Planks made in this way are suitable for the sills, where the best selected stock is none too good. Experience shows that sills made from built-up planks are reliable in service and are less subject to change of shape through moisture. The different pieces glued together act as a check on one another.

Laminated wood cannot be considered as a wood saver, as the more expensive wood serves as the veneer and cheaper wood as the core. Laminated wood, however, cannot be trusted where it is likely to be exposed to moisture, unless made with the newer process of using casein waterproof glue. The price keeps this out of use for the places where such wood is adapted, namely, seat boards and linings. It is useful, however, for instrument boards and finish.

Last but not least, as a saving agent for the wood supply, is good designing. Layout work well done takes into consideration all the angles of making the thickness of the plank count. This is accomplished by laying out each piece with reference to the plank size minus the loss in machine operation. Such work costs in time but, if the number of bodies to be manufactured is large enough to warrant the expense, it is one of the chief factors in material saving.

Woods for Body Framing

The woods used for body framing are ash, oak, maple, elm, beech, birch, gum, sycamore and chestnut. White-wood, pine, spruce and basswood are used for seat boards and sometimes for floorboards.

Ash has always been considered the finest wood for body framing. Selected virgin growth, or forest growth, is termed body ash. It is slightly darker or redder than the second growth and generally called white ash. The latter is tougher and stronger and has large annular rings on account of its more rapid maturity. The trees receive more sun as they are not so thickly clustered together and are the result of the growth that matures after the forest has been cut down. Both forest growth and second growth were considered the ideal body timber as long as they were readily available, and some builders still prefer to pay the price and have white ash sills, using cheaper woods for the other parts.

Oak was never much of a factor in body work, except for trucks. Its ability to resist the decaying influence of water has always made it valuable for the latter service, and for the same reason it is ideal for floorboards. Inferior grades not suitable for furniture making are bought up by body builders for this use. The kind used is either the black or the red, principally the latter.

White oak has always been reserved for wagon poles, etc., where strength is required.

Maple is receiving more attention to-day than any other wood for body work. When of good quality it is suitable for use in all parts of the frame, including the sills. The varieties are hard, black, red and silver. The hard and black are the best woods. The drawback of maple is its excessive weight. A touring body made from maple will weigh 50 to 80 lb. more than one made from elm.

Elm is a good substitute for all body framing except the sills. There are the rock, red and white or gray. Sound gray elm with ash or maple sills and oak floorboards is as good a combination as any body, even the finest job, will require. It has the advantage both of strength and light weight. Elm has always been considered the best wood for the trim rail of touring cars, as it will stand the punishment of being drawn down to uneven metal surfaces with bolts with out checking. No other wood has the same qualities of endurance and adaptability for the exacting work required of the common trim rail on touring and runabout bodies.

Beech, Birch and Chestnut

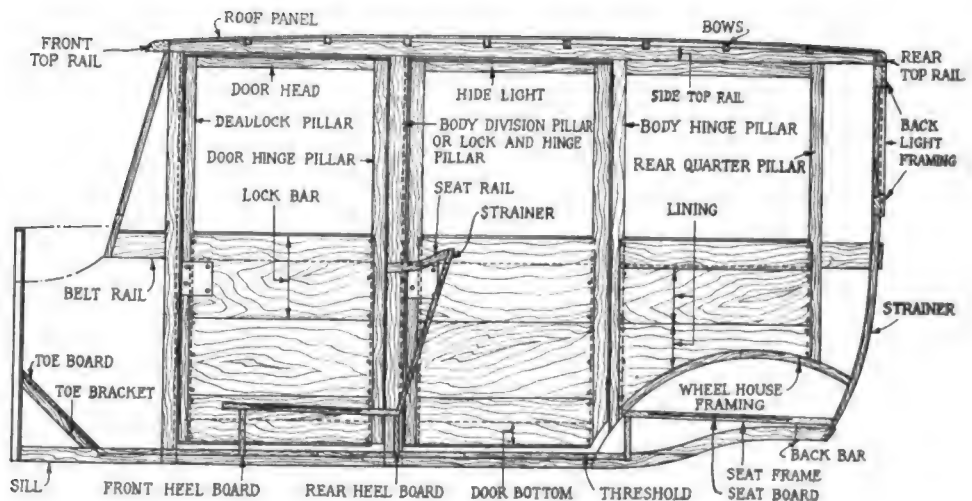
Beech and birch are somewhat of the nature of the maple. They do not come into use in sufficient quantities to be a factor.

Chestnut is a wood that resembles oak in appearance, except for the color, which is somewhat the tint of the straw. It has never been much used in body work, on account of checks developing after the body had been framed up. However, when it can be secured it makes good framing stock. It can be used to advantage as floorboards, seat frames and framing, except sills.

Red gum has only come into use of late as a body asset. It is a close-grained wood, stains well and has been used for furniture and interior finish. Its disadvantages have been that it warps and twists badly in drying and wastes greatly, as the twist will at times be the full thickness of the board. It has been proven recently, however that this wood can be kiln-dried and made to compare favorably in non-twisting qualities with other lumber. Its value has increased correspondingly, and it has and is being used for most parts of the frame except the sills. Bodies have been made and given good service in which gum has been used for the entire frame, even the sills. Usually, however, its use is confined to seat frames, strainers, etc.

Sycamore is not much used because it is not abundant in the market. It compares in strength with the best grade of gum and makes up well as a natural finish.

Seat boards are made of soft wood and, as narrow strips can be used for this, waste stock is generally used to fill the needs. Culls of whitewood are generally preferred,



The woodwork in an enclosed body

but almost any wood that does not have a resinous sap will be good enough.

The two illustrations show the framework of an open and a closed body. The views are longitudinal sections along the center line and the interior view of the right side is shown. All the pieces of woodwork are named; where the piece is duplicated, the name is not repeated.

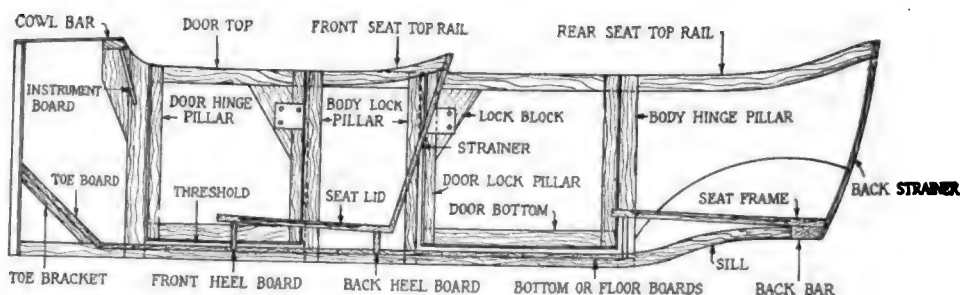
It can be readily understood from these diagrams that the quality of wood does not need to be high class for all the parts; in fact, once you have become accustomed to thinking of substituting the cheaper grades in places where strength is not essential, automatically one is surprised that it has not been done earlier. Of course, practical men have always realized what are essential requirements for strength in the various pieces making up the framing. It has been the builder's business reputation, however, on the one hand and specifications made up for their advertising value on the other that have kept conditions stationary. It makes a good talking point to say selected ash framing to the car buyer but in practice just as good results are obtained by using any alive and sound hard lumber. The terms alive and dead are used in speaking of wood. But this has no application to the age or use that the timber may have had. It refers to decay or dry rot and the disintegrating forces set up in the process.

The sills and the door pillars, the latter particularly on closed bodies, are the essentials. The sills must be of good sound stock and strong, because the chassis frame may or may not give the required support. Generally they do, but the sills must be rigid to keep the door openings true so as to prevent binding of the doors when opening and closing and, in open bodies, the sills could be broken entirely through at the doorway when handling. Closed bodies have a roof that prevents this buckling, but an open job has no reinforcement to the sill at this point.

Lock Pillars of the Doors

On closed bodies, as the lock pillars of the door are the weakest part, these pillars are made with a spring in them. That is, they are made to have a tension when locked; therefore, there is a constant strain in use and naturally the best wood will give out in time. Except for these places mentioned, there are no parts of the frame that require careful nursing; the floor or bottom boards are the best of oak, ash or chestnut because they have resisting qualities against the action of rotting from water, particularly the first-named wood. Of ash or chestnut, probably the latter may have a little the advantage in this respect and, speaking from past experience, the writer has had bodies brought in for repairs showing that the forest growth or soft ash resists the rot from water contact better than the stronger white or second growth. Maple is not a good wood to use where it will be subject to much wetting but necessity compels us to disregard this condition for sills as it is one of the few woods available that are strong enough and in sufficient quantities in the market. The quality of resisting the decay from water rot is not as essential as generally supposed; it is largely imaginary to suppose a body will pass the other stages of its ills long enough to have the water vitally affect it.

Viewing the two illustrations finally, it will be seen that the process of manufacture whereby the frame is encased and supported by a metal shell generally of 20-gage steel, is a condition that makes the frame of relatively minor importance in many places on the touring body, and to some extent on the closed job. As stated before, there



The framework in an open body

are bodies that depend upon wood only for floorboards and rails for fastening the trimming tacks and, between the bodies made in this manner and those with frames as illustrated, there are many variations in which wood is dispensed with at the less essential places so that it is fair to say the open body will become more and more an all-metal job as time goes on.

Closed bodies are not so easy to make in this manner but the large size of many of the pieces makes it possible to use soft wood. In fact it has been the practice, even in the carriage days, to make some of the pillars and the top rail of bass—sometimes called linnwood and white-wood. It only remains for the automobile manufacturer to be willing to accept the judgment of the body man and have the specifications read so as to permit him to use the woods available in the manner best suited.

The statement is emphasized again, that as bodies are now constructed with steel panels shaped and welded together, there is sufficient strength in the panels alone to withstand the strain and the wood for the major part is simply a filler in to get size or thickness, to hold the bolts and screws and to fasten the trimming. Therefore, this article will have failed its purpose if it does not serve as an influence in inducing those responsible in making out specifications to be more generous in the latitude allowed the body maker as to the wood to be used.

The wood must be sound and alive. This is the prime essential. The sills and doors must be hard lumber and strong and the other parts can be graded down, making use of any wood of the list mentioned.

Aircraft Committee Reports

COPIES of the following reports of the National Advisory Committee for Aeronautics have recently been received:

No. 46.—A Study of Airplane Engine Tests, by Victor R. Gage.

No. 47.—Power Characteristics of Fuels for Aircraft Engines, by H. C. Dickinson, W. S. James, E. W. Roberts, V. R. Gage and D. R. Harper, 3d.

No. 55.—Investigation of the Muffing Problem of Airplane Engines, by G. B. Upton and V. R. Gage.

No. 61.—Head Resistance Due to Radiators, by R. V. Kleinschmidt and S. R. Parsons.

Copies of these reports can be obtained from the National Advisory Committee at Washington.

THE French Secretary for Aviation and Transport has appointed a technical and consulting committee for the general improvement and furtherance of aviation in France. The committee will deal with research work, aerodynamics, improvements of all kinds, inventions, aerial navigation, and instruction and examination in all branches of aviation.

A Review of the Methods and Operations of Japanning Practice

AUTOMOTIVE INDUSTRIES, in its issues of March 11 and March 18, this year, published a two-part article on Japanning Practice by W. A. Darrah. This is a constructive criticism and an explanation of Mr. Darrah's points.

By Carl J. Schumann*

THE splendid article by Mr. W. A. Darrah, "A Study of the Methods and Operations of Japanning Practice," recently published in AUTOMOTIVE INDUSTRIES, added to the all too limited printed word on this subject so vital to the automotive industry. The desire in discussing various points in Mr. Darrah's article is entirely with a view of correcting some technical errors and offering constructive criticism which it is felt will be for the good of the industry.

The black baking japan finish now used on automobiles is but the grandchild of the black japan finish so common on pen holder handles in the days of our parents. Manufacturing recipes of a century ago are used to-day because those were good recipes and it has been almost impossible to improve on them.

The term "rubber coat" or "rubber finish" has come into use because of the similarity in appearance of the finish obtained with pigment black japan to the finish of molded rubber parts. Rubber will not mix with linseed oil and it is not employed in making japans. The "rubber" appearance of the first coat japan is due entirely to the pigment and oil combination.

Mr. Darrah speaks of the relatively small use of black pitches or gums. Black asphaltum, or "Gilsonite," gives to the finishing black baking japans on automobiles, its color, its luster and to some extent its hardness. In the cheap black japans used largely on castings, black pitch gives the color. Finishing japans are known as "clear japans," that is, they contain no pigment. Carbon black is used in first coat japan, because it hides densely and the first coater will cover black on sharp edges where finishing japans, because of the thin film, would show up with a brownish cast.

The dryers used in making japans are all organic or inorganic salts of lead, manganese and cobalt; dryers that are entirely organic are not used. Dryers (in liquid form) as sold commercially should not be mixed with baking japan, as such mixture probably will lead to trouble.

The Viscosity

The viscosity at which a japan should be used is more frequently spoken of as the Baumé or Specific Gravity. One japan and one solvent should be mixed in varying proportions to determine by practical tests what proportion gives the best results. The specific gravity of that particular japan and of that particular solvent and the specific gravity of the resulting mixture should be taken and the latter figures always used for those goods. Each specific gravity is good only for that combination and

does not hold good if some other japan or some other solvent is used.

The above point is of the greatest importance in testing goods of another make than that ordinarily used. All too frequently new goods are only tested and reduced to the specific gravity at which the old goods were worked. If the result is satisfactory, O. K.; if not, the new goods are condemned. That is not fair. The specific gravity of the new goods should be taken and the proper working mixture determined and the specific gravity observed. The reduction figures and the prices give an index of which japan is more economical.

Buying on the Price Basis

As a good automobile finishing japan weathers anywhere from two to three years, depending upon the care taken of the machine, it is seen that an actual life test is almost out of the question. As the author says, "a trial application or tests of the resulting enamelled surface is a successful and reasonable basis for selecting japans." It is unfortunately too true, that some of the largest automobile manufacturers set a price which they are willing to pay for their baking japan and place the business with the manufacturer who will meet that price.

In speaking of the gums used in making japans, your author is correct in saying that the higher grade japans contain the more expensive gums, that is the better quality of "Gilsonite." Some very cheap japans are made from stearine pitch or other pitches. Shellac cannot be used in making baking japan. Shellac is sometimes used in what is known as a grinding japan, a vehicle in which colors are ground to make the so-called "color in japan," used as a foundation color coat on automobile body work.

The writer is in most hearty accord with your author's findings on requirements as to adequate supervision, storage, mixing equipment, etc., the use of proper viscosity standards, the keeping of japan at uniform temperature, etc.

It is true that even the highest grades of japans which contain pigment will deposit some of the heavier ingredients on long standing. The finishing japans which contain no pigment have nothing to deposit.

As to the application of material by the spraying method—where this is done with proper equipment—that is a hood in which the work is placed during the spraying operation, such hoods equipped with adequate exhaust fan there is really no inconvenience to the operator.

In speaking of the spraying methods, your author says, "with the painting of chassis and similar parts that do not require a high grade finish." Why should not the chassis be finished with just as high grade durable ma-

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terials as is used on the hood, fenders, radiator, shell, wheels and body? Why finish a chassis with material which will begin to go to pieces in six months, when the finish on the fender will stand up for three years? Unfortunately, such is the condition. In the writer's opinion this is brought about largely because the finish on the chassis is sacrificed to production schedules. In some plants their schedule calls for not even removing the poor primer which is put on the chassis frame as a rust preventative by the maker and the automobile manufacturer wants to put over this only one coat of material. This he puts through a temperature of 150 deg. Fahr. for 45 min. and then expects the finish to be dry enough so that he can proceed to assemble. Such a finish is not at all worthy of even the lowest priced cars.

In preparing estimates of the japan needed for a production, say of 100 cars per day, assuming that one coat of first coat and two of finishing are used, the question would be, how many gallons of each japan and how many gallons of reducer are required to take care of this output of fenders, etc., for 100 cars per day. The estimator is faced with the question of not how much material is left on the surface when finished; he reasons, if three gallons of japan are reduced with two gallons of solvent, how many square feet of surface will the combination of five gallons cover. When applied by the dip method, one gallon of material so reduced should cover at least 600 sq. ft. of surface, that is, 300 sq. ft. of metal covered, one coat on two sides. The estimate of 600 sq. ft. per gallon of reduced material is fairly correct. On such basis it is

easy to calculate approximately the amount of japan needed.

One cannot help but reiterate your author's statement, "It is good practice to clean thoroughly the metal surface before applying the japan coating." Nowhere is this better realized than on any work where the japanning is done on brass, for the least grease mark or finger mark shows even through several coats of japan. On steel, unless grease and rust are removed the japan finish will not be smooth and will tend to come off, often after only a few months of service.

Of cleaning processes, it should be added to those mentioned by your author that of first washing the parts in a boiling solution of Oakite or similar cleaner, and then in boiling water.

Your author's information about baking equipment is very good indeed.

It might be well to point out the reason manufacturers of baking japans prefer to have their goods baked at the lowest possible temperature. When baking at low temperatures, if through some error the temperature is ten or twenty degrees higher or for some reason the time of baking is fifteen to twenty minutes longer, there would be no danger of spoiled work. In the case of high temperatures for a short period of time, an additional twenty-five degrees temperature, or an additional ten minutes time might overbake the japan and cause it to chip from the metal. The best qualities of black baking japans may be satisfactorily baked at somewhat lower temperatures than given, that is, at 300 deg. Fahr. for 3 hr.

Inverted Engine for Burning Kerosene

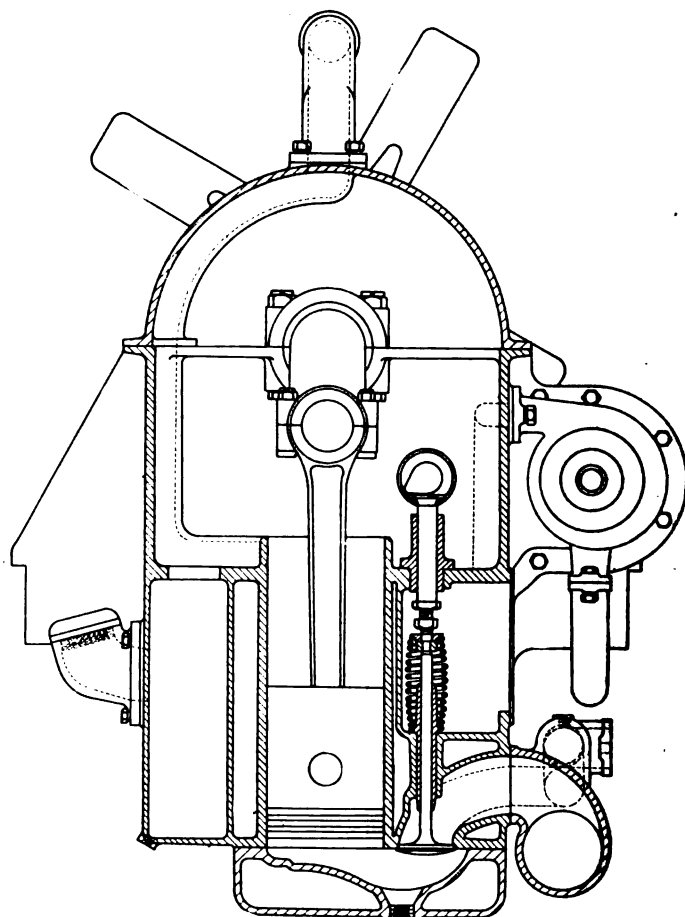
THERE seems to be a general impression that the large cylinder horizontal engines which characterize some of the older tractors are "getting away" with kerosene much better than the four-cylinder engines which are used on most of the newer tractors. This is probably partly due to the greater heat in the larger cylinders, which results in the vaporization of a larger proportion of the fuel. In a combustion chamber the amount of heat liberated increases as the cube of the linear dimensions while the cooling surface increases only as the square of the linear dimensions, hence the heat cannot escape so quickly from a large combustion chamber and the temperature undoubtedly attains a higher value.

Another factor is the arrangement of the cylinders. In a vertical cylinder any unvaporized fuel naturally tends to drain into the crank chamber, and some designers bevel off the top edge of the pistons, thus making the path as easy as possible. If the cylinder is horizontal the force of gravity does not influence any unconsumed fuel to flow toward the crank chamber, if there is a remnant of fuel after an explosion it may be vaporized and consumed during subsequent strokes, or else expelled from the cylinder with the exhaust.

W. H. Johnson, of the Dart Motor Truck Co., has designed a four-cylinder tractor engine for kerosene in which the cylinders are inverted. The object is to cope with the crankcase oil dilution difficulty. This arrangement of the cylinders necessitates full force feed oiling, except for the cylinders, which are lubricated by the spray from the crankshaft. To prevent too much of this spray getting into the cylinders, the barrels are extended up into the crankcase a short distance. The oil collecting on the crankchamber walls is thus drained off into an oil reservoir cast alongside the cylinders.

One advantage of the inverted engine is that the belt pulley can be driven directly. The water outlet pipe is

cast on the inside of the crankcase. The engine is still in the development stage.



Foundry Production and the Structure of the Plant

A small Eastern foundry presents many features of modern foundry practice which are conducive to increased production and decreased turnover. The following article tells, among other things, how one foundry was able to keep men at work through the hot days of last summer.

THE improved construction of modern foundry buildings is an important factor in the betterment of foundry working conditions. Improvements both in equipment and methods, which might be impossible in an old building, can be advantageously applied in a new structure. For this reason, the path toward ultimate progress in foundry development is likely to be found through the new plant, rather than through the old structure to which improvements have been added.

The possibilities of modern foundry construction and production methods are illustrated well in a small foundry recently erected in New England. Its small size makes it especially interesting, since the theory of the building construction and production system can easily be seen in perspective without exhaustive study and investigation.

The entire foundry, including some 1033 sq. ft. of office space, covers an area of 10,757 sq. ft. The average working force is about 42 to 45 men. The work is such that only two core-makers are necessary, while most of the molding is done by machine. There are six of these machines, four of which are usually in operation. Two or three expert hand molders are kept at work.

The building construction is modern in every respect, the roof being about 35 ft. high at the center and about 24 ft. at the sides. The sides of the molding room are almost entirely of glass, while the room in which the metal is heated has sides which can be opened in sections. This arrangement gives ample light and permits proper ventilation without danger of drafts.

Adequate and cleanly toilet facilities are, of course, provided, including wash basins, shower baths, lockers, etc. Here, as in many other places, the men take advantage of the wash basins much more extensively than of the shower baths. The structure is steam heated throughout.

The work produced in this foundry, chiefly for railroad cars and locomotives, consists of journal bearings, engine castings, etc. Bushings for automobiles are also made. A great deal of repetition work is done but changes are necessary often enough to prevent a system of quantity production such as is planned for the new Lycoming foundry. The production of this plant averages about 350,000 lb. per month, a high total considering the type of castings made and the number of men employed.

The floor plan shown in the accompanying drawing illustrates a number of features which embody the best modern practice in foundry construction. The building is divided into sections which are practically separate. The room where the metal is heated is separated by a wide partition from the section in which the molders work. Doorways at each side, however, connect the two

rooms. The partition prevents the smoke which arises when the oil furnaces are being started and the terrific heat later generated from spreading readily throughout the entire building.

The sides of the melting room, as previously noted, are so constructed that they can be opened in section to permit the best possible ventilation. When all three sides are down on a hot summer day, the men working there are assured of any air that may be stirring. Though work near such furnaces must of necessity be hot and unpleasant at certain times, conditions in this foundry are much better than the average, since the excellent ventilation makes the heat extreme only in the area directly surrounding the furnaces.

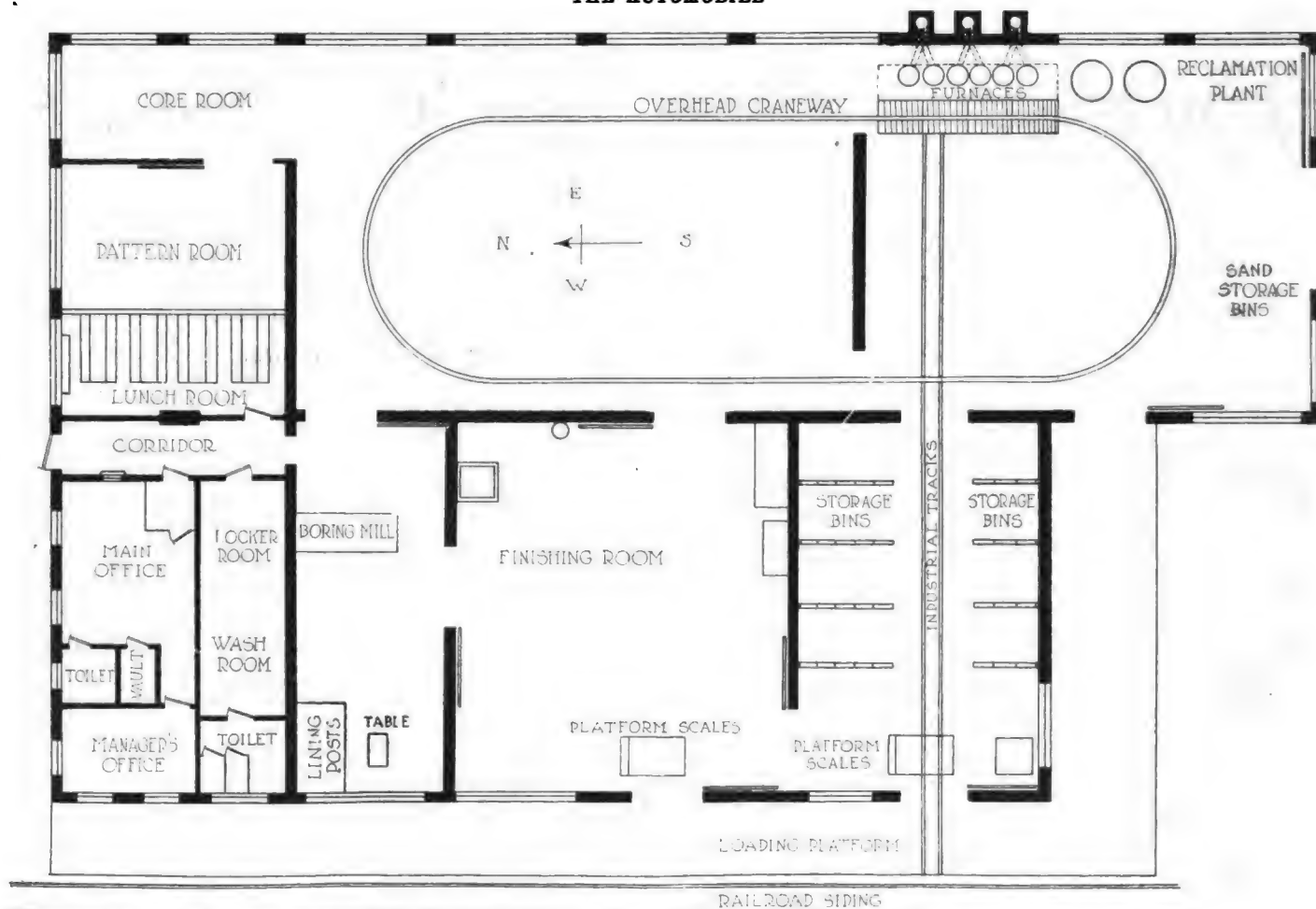
The windows which comprise the walls of the molding room can also be opened in sections. The ventilation is so regulated as to carry off almost at once the dust arising from mixing sand and the gases from the molds. Even when some molds are being poured and others are being shaken out simultaneously, the atmosphere is clear and pleasant to breathe.

In a separate room adjoining the molding section is the finishing room where the castings are cleaned and chipped. The dust resulting from the cleaning process and the chips flying from the castings are thus segregated from the main part of the shop. Tumblers are used for cleaning, while only the rough edges are chipped off.

Under these excellent working conditions an effective production system for a small foundry has been developed. The sand for molding is stored in concrete bins at the south end of the building and is carried by wheelbarrows through the melting room to the molding room for mixing. It is expedient to do this because the amount of sand thus carried in one day is far too small to warrant a conveyor or similar mechanical laboring device.

The molders work chiefly at the north end of the molding room, each one mixing his own sand. As the molds are finished, they are lined up along the west side of the room. An overhead crane running on an oval track, as indicated in the drawing, is used to carry the hot metal from the furnaces to the molds. The metal is then poured and the molds are allowed to cool in their places.

The molds are finally shaken out at the south end of the molding room, near the partition which separates that room from the furnace section. Although thirty or forty molds are poured at a time and although a number are subsequently shaken out in rapid succession, the construction of the building allows such excellent ventilation as to prevent the air being unpleasantly full of gases or the light being obstructed by steam or dust.



Ground plan of a small foundry, illustrating relation of building structure and plant layout to working conditions

The oval track of the overhead crane permits the use of the machine in carrying castings to their place in the pouring line and for the conveyance of heavy materials from one part of the shop to another. It has been found more economical for work of this type, which changes frequently and often requires careful pouring, to carry the metal to the molds for pouring rather than to carry the molds on a conveyor to a central pouring point.

Having cooled and having been shaken out, the castings go into the adjacent finishing room, where they are tumbled and chipped. A small machine shop is operated for repair work, but no machine work is done on castings. From the finishing room the castings go to the boring mill, where such castings as journal bearings, etc., are bored and lined with babbitt metal.

The castings are then ready for shipment and are trucked to the loading platforms on the west side of the building. A railroad siding provides ready shipping facilities.

The experience of this well-equipped foundry during the hot days of last year is especially interesting, since authorities are predicting a crisis in foundry production during the coming summer. The effective ventilation and working conditions enabled the shop to run without shutting down for even one day during the hot spells of last summer—a record not equalled by many foundries.

Although affected by the general spirit of unrest, as in other foundries, the labor turnover is low enough to warrant the belief that working conditions are a definite factor in reducing it. Accurate turnover records have

not been kept, but a conservative estimate places it at about 23 per cent a month, and it is a highly favorable result as compared with many automobile foundries. The average turnover in automotive plants in Detroit, for instance, has been close to 21 per cent for some months, while the foundry rate is usually about twice as high as the average for an entire plant. It has been found, also, in this New England foundry that men need less time off on account of illness than in foundries of a similar size where disagreeable working conditions prevail.

This foundry has its problems and troubles as does any other plant working under present-day conditions, but the advantages of modern equipment, excellent working conditions and a properly constructed foundry building are found to be significant factors in overcoming to a large extent the evils of labor turnover and curtailed production. Though no special effort has been made to approach the foundry problem from the human side, the results achieved in this plant have thoroughly "sold" the idea of good working conditions to the management.

ACCORDING to a paper read in Berlin by Dr. Wittefield on Future Heat Engineering, development of the Holzwarth Gas Turbine (which has been repeatedly mentioned in AUTOMOTIVE INDUSTRIES) has reached a stage where the German railroad administration felt justified in placing an order for a 3300-kw. turbine generating plant for the railroad power station in Muldenstein. There is also in course of construction a (railroad) motor car with oil turbine, a power plant which should prove applicable to marine propulsion as well.

Foreign Tire Import Duties

THE following table, corrected to March 15 by the Bureau of Foreign and Domestic Commerce, which was originally compiled for the *India Rubber World*, includes foreign import duties on rubber tires and export duties to various countries from the United States. Such charges as warehousing, customs handling, local taxes, etc., are not included and the rates of duties including surtaxes as noted, should, consequently, be regarded as

the minimum. These duties change frequently and hence it would be advisable to correct the table as often as will be found necessary.

The column marked "weight" denotes whether duties are levied on net or gross weight or simply inner packings. The second column gives the rate of the duty for each 100 lb. in United States currency, and the third column the rate per cent ad valorem.

Countries.	Weight.	Rate per 100 lb.	% Ad Valorem.
Canada			42.5
(Ad valorem duties are based on the fair market value of the articles when sold for home consumption in the country whence exported direct to Canada.)			
Central American States—			
British Honduras			25
(Duties based on price in the port of export)			
Costa Rica	Gross	\$4.22	
(In addition, there is a wharfage tax of 10.5 cents per 100 lb.)			
Guatemala	Gross	7.21	
Honduras	Gross	4.36	
Nicaragua—Tires, inner tubes for			
Auto tires.....			
Solid tires.....	Net	27.27	
Motorcycle tires			
Panama			15
Salvador	Gross	13.81	
(A surtax of 11½ per cent of the duty is included.)			
Hawaii			Free
(Imports from foreign countries are subject to the United States tariff.)			
Mexico—Auto and motorcycle tires			
Solid		11.28	
Pneumatic	Gross	22.56	
Bicycle tires..	Legal	22.56	
(Not including variable paper surtax.)			
Newfoundland			49.5
(A surtax of 10 per cent of the duty is included.)			
West Indies—			
British—			
*Antigua			13.33
*Bahamas			25
*Barbados			11.25
Bermuda			11
*Dominica			12.5
*Grenada			10
Jamaica			16.66
(Tires for motor vehicles are subject to a surtax of 20 per cent.)			
*Montserrat			13.33
*St. Christopher—			
Nevis			11
*St. Lucia			16.5
*St. Vincent.....			12.5
*Trinidad and			
Tobago			10
Turks and Caicos			
Islands			10
Virgin Islands..			10
*When imported from the United Kingdom, Canada or Newfoundland, admitted at a reduction of one-fifth of the duty. The cost of packing is excluded, except in Dominica, St. Lucia and Grenada, where it is included.			
†A surtax of 10 per cent is included.			
Cuba			25
Dominican Republic—			
Tires for autos, cycles, etc....	Net	5.69	
Tire for trucks.			Free
Dutch Colonies...			3
French—			
Guadeloupe			6
Martinique (rates not specified).			
(Imports of other than French origin pay also the regular French import duties.)			
Haiti			22.24
Porto Rico			Free
(Imports from foreign countries are subject to the provisions of the United States tariff.)			
Virgin Islands of the United States..			Free
(Imports from foreign countries are temporarily subject to the duties formerly in force in the Danish West Indies.)			
SOUTH AMERICA:			
Argentina—			
Auto and solid tires	Legal	23.02	
Bolivia	Gross	20.29	
Countries.	Weight.	Rate per 100 lb.	% Ad Valorem.
Brazil—Auto tires of Para rubber..			12.51
Other auto tires.			28.89
Motor truck tires			12.51
Chile	Gross	9.93	
Colombia	Gross	0.97	
Ecuador	Legal	9.93	
Gulana—British ..			16.5
(When imported from the United Kingdom, Canada or Newfoundland, admitted at a reduction of one-fifth of the duty.)			
Dutch			10
French			5
(The regular French import duties are also collected on goods not of French origin.)			
Paraguay—			
Auto tires.....	Legal	60.93	
Bicycle and motorcycle tires.....	Legal	76.16	
Peru—Auto tires...	Gross	24.28	
Other tires.....	Legal	36.42	
Uruguay			45
Venezuela	Gross	10.28	
EUROPE:			
Austria-Hungary ..	Net	13.81	
Belgium—Solid tires	Net	5.69	
Auto tires.....	Net	10.16	
(Casings only.)			
Inner tubes.....	Net	14.88	
Bulgaria—Tires and tubes.....	Net	5.25	
Denmark—			
Auto tires.....	Net	6.08	
Solid tires			Free
Czechoslovakia—			
Tires and tubes..	Net	13.13	
Faroe Islands.....			Free
Finland—			
Auto tires..			
Inner tubes }	Legal	\$12.55	
France—Auto tires and tubes.	Net	17.07	
Solid tires	Net	11.38	
Cycle tires	Net	37.54	
Germany—			
Auto tires.....	Net	6.48	
Inner tubes.....	Net	6.48	
Gibraltar			Free
Greece	Net	1.03	
Iceland	Net	0.24	
Italy—Auto tires and tubes	Net	5.25	
Malta			5
Netherlands			5
Norway—Auto tires	Net	3.65	
Motorcycle tires..	Net	3.65	
Portugal	Net	1.60	
(Conversion to U. S. currency is based on the latest quotation of the paper mills.)			
Roumania—			
Auto tires.....	Legal	9.06 2% ad val.	
Solid tires.....	Legal	4.90 2% ad val.	
Servia (Jugo-Slov.)	Net	13.16	
Spain—Solid tires.	Net	17.51	
Casings and inner tubes	Net	24.64	
Sweden—Auto tires	Net	14.59	
Solid tires	Net	9.73	
Switzerland—			
Auto tires	Gross	0.44	
Solid tires	Gross	0.09	
Turkey		15.00	
United Kingdom..			Free
ASIA:			
British—			
Aden			Free
Ceylon			7.5
(Duty based on wholesale cash price in bond, less trade discount at the port of entry.)			
Countries.	Weight.	Rate per 100 lb.	% Ad Valorem.
Cyprus			10
(Duty based on export price with addition of cost of transport [including insurance] to the port of final discharge.)			
Federated Malay States			10
Hongkong			Free
India			7.5
(See note to Ceylon.)			
North Borneo ..			10
Sarawak			Free
Straits Settlements ..			Free
China			5
Chosen (Korea)...			8
(After Aug. 1920, the Japanese tariff applies.)			
Dutch E. Indies...			10
French Indo-China..			
(Imports from France are admitted free of duty, while imports from other countries are subject to the rates prescribed by the customs tariff of France.)			
Japan (including Formosa)—			
Auto tires.....			25
Cycle tires.....	Net	\$42.92	
Persia			10
Siam			3
Syria			11
(Plus 1% if by Egypt.)			
AFRICA:			
Abyssinia			10
Belgian Congo			10
British—			
Mauritius			12
Nigeria			Free
Union of S. Africa ..			20
(Duty based on the current value for home consumption at the place of purchase, including value of packing and agent's commission if it exceeds 5 per cent.)			
Zanzibar			7.5
(The dutiable value of imports from Europe or America is taken to be the cost price [with charges], increased by 5 per cent or the invoice price [exclusive of charges], increased by 15 per cent.)			
Egypt			8
(In Alexandria a wharfage tax of one-half of 1 per cent is added. At other ports different rates are imposed.)			
French Algeria.....			
(Imports from France are admitted free of duty, while imports from other countries are subject to the rates prescribed by the customs tariff of France.)			
Italian—			
Eritrea			8
Libia			11
Somaliland			15
Liberia			12.5
Morocco			12.5
OCEANIA:			
British—			
Australia			35
(Duty based on fair market value F.O.B. at port of export, plus 10 per cent. On casings weighing over 2½ lb. and inner tubes over 1 lb. each, 48.6 cents per lb., if higher than the ad valorem rate.)			
New Zealand ...			1
Guam			Free
(Imports of foreign origin are taxed 25 per cent of their value.)			
Philippine Islands..			Free
(Imports of foreign origin are taxed 25 per cent of their value.)			
Tutulla			10
Legal weight is not uniformly construed but generally includes the weight of the immediate packing or container, though in some countries fixed tare allowances are made.			

The Vehicle Maker's Responsibility for Repairing of Assembled Units

The writer of this article assumes that the maker must see that the vehicle must be kept going and, if his dealer is not entirely competent to handle repairs on certain intricate equipment, it is the manufacturer who must see that this service is provided. This is a part of the marketing plan.

By E. A. Haskins*

AN immediate clarification of the subject under consideration is obtained if we change the two words, service relation, to maintenance relations, and the much-buffed word, service, can be relieved of its mystery if given the common sense interpretation, "Maintenance." I will, therefore, ask your consideration of the subject, "Maintenance Relations Between Parts Manufacturer, Vehicle Manufacturer, the Distributer, Dealer and Owner."

In the following discussion, we may use the term dealer in a general sense meaning the vehicle manufacturer's distributing organization. We will also make two general subdivisions; one the furnishing of parts, and the other their installation, under which will come the general discussion of instruction.

If every seller of merchandise only would have vision enough to realize the value of proper maintenance, this subject would need no discussion. Under existing conditions, however, the future sales value—good-will, if you please—resulting from legitimate business-like efforts to keep equipment in operation, has been subservient to the idea of production, immediate sales and immediate profit.

Some seem to have considered the maintenance problem as a burden or a necessary evil rather than one of the important divisions essential to the continued popularity and sale of their product. Others have surrounded it with a veil of mystery, intimating that there is only one place to secure parts and only one way in which parts can be made to perform satisfactorily the function intended. This does not apply to parts other than those covered by the subject under consideration.

To get down to particulars, we like to think of maintenance as vital but still incidental to the real problem, that is, the sale of the finished product. We are not in business to sell parts but to keep equipment in operation. We are not vitally interested where the customer secures supplies necessary to maintain his vehicles as long as parts are up to the standard necessary to secure best results.

The Chain of Interdependence

There are two ways of visualizing the interdependence of all parties under discussion. First: Consider each as a link in a chain, each one responsible to the link on either side; starting with the parts maker as the ring and through the vehicle maker, distributor, dealer to owner, we find owner—the man who pays all our bills—dependent for satisfaction upon the parts maker. Mr. Owner does not necessarily appreciate this fact and if dealer, distributor and vehicle manufacturer, especially the lat-

ter, are measuring up to their responsibility, or rather opportunity, the owner will not need to have this forced to his attention. Likewise, dealer, distributor and, finally, the vehicle maker are hampered or helped by the parts maker's maintenance facilities.

The Manufacturer

Let us not throw too much of the load upon the ring end of the chain. Let the vehicle manufacturer consider himself as a wholesaler or jobber carrying a stock of suitable size to cover several months' requirements and endeavoring to educate the distributor and dealer to appreciate that they are the retail organization and upon them rests the opportunity of carrying a stock sufficient to care for day-to-day demands so that the hook end of the chain will really assist in catching additional buyers.

Second: Consider a pyramid with parts maker at the apex and owner at the base. All our increase in business is based on owner's satisfaction. If parts maker's product or service is not up to standard, the owner will spread his feeling of dissatisfaction so thoroughly as to ultimately hinder parts maker's sales and he is, or should be, vitally interested in owner's satisfaction, even though he does not get into personal contact with the owner, as do the other interested parties.

Now for the price. Everything bears a price—even satisfactory service costs something. The question of discount and list price has caused much discussion. It is manifestly unfair for the parts maker to establish list prices and discounts so that the price to owner, if passed direct by him, is much different than when handled by vehicle manufacturer and his distributing organization. I say much different advisedly, for it has never been our policy to attempt to hold to parts maker's list if this provided a greater or less profit than considered legitimate.

We have endeavored to make our Service and Parts Division sufficiently attractive so that after the dealer has been properly started by vehicle manufacturer he will have real financial reasons for keeping it up. The real fundamental of maintenance is speed or promptness of repairs. What matters a few cents more or less compared to a vehicle tied up for several hours or days?

It would greatly simplify matters, therefore, if the parts maker would establish a discount sufficient to enable his list price to mean something only as a comparison. Let him protect the vehicle manufacturer regarding deliveries and not supply owners or dealers direct when he is not shipping some parts to the vehicle manufacturer, who may have orders for similar parts which have remained unfilled for some period.

If the distributor is worthy of the name, let him be

*Mr. Haskins is service manager of the Federal Motor Truck Co.

the headquarters for parts and repairs in his territory. If the party nearest the owner is honestly trying to give service, justify his efforts, and do no more yourself than you are legitimately asking him to do. Do not let anyone get the impression that he can get any more by going over the dealer's head.

Let us all protect the party next in line on the hook end of the chain whenever he is trying his best, but, of paramount importance, keep the owner happy, even at the sacrifice of pride or immediate profit. I have no patience with the dealer who is not trying his best to help—factory assistance on more than one occasion may have cost him money.

If the parts manufacturer's product is of a specialized nature demanding more care, knowledge or experience in its maintenance than can be expected of the vehicle manufacturer dealer's force, let the parts manufacturer establish his own widespread repair system and work with the dealer in caring for such work. We can see no reason why the vehicle manufacturer should receive any remuneration in any fashion from such work which has been performed without his knowledge or assistance and without material in which he has his money invested.

The parts manufacturer should appreciate the necessity of keeping the vehicle manufacturer informed in advance of proposed changes in design, so that we all have an opportunity of preparing to care for these changes and not wait until such changes are in production.

An ideal way, therefore, is to have the owner cared for by the dealer who has a reasonable stock of most ac-

tive repair parts and dependent upon the distributor for replenishment of his stock and for parts seldom used, as well as expert mechanical assistance and instruction. The distributor, in turn, depends upon the vehicle manufacturer for his supply of parts so that his efforts can be roughly checked. Failure of any one of these should permit the owner to receive prompt and immediate attention from the parts maker in such a way that the other parties may be kept informed of their shortcomings and proper action taken to prevent repetition.

The price demanded by the parts maker from the owner should be sufficient to discourage such relations if the dealer is trying honestly to maintain the owner's equipment. We believe that the parts maker's price should be greater than the vehicle manufacturer's list so as to discourage direct dealing, unless the vehicle maker or dealer is not making an honest effort in the owner's behalf.

The furnishing of parts is given the position of importance due to its being by far the most important feature of satisfactory maintenance. Parts themselves, however, are of little value unless properly installed. Therefore, every vehicle manufacturer should be able to secure suitable instruction from the parts maker so that he can in turn properly instruct the dealer's organization by means of shop courses, schools and printed instructions.

Let us all help, not hinder. There is no such thing as free service. Therefore, if it costs money, charge for it; if we are wrong, admit it. Give uniform treatment. Make anything worth while worth money and some of our problems will be simplified.

A New All Fuel Carbureter

SEVERAL kerosene burning tractor engines are equipped with the Holley All Fuel Carbureter, designed to vaporize thoroughly the fuel without excessive preheating. This is a development of the kerosene burning equipment originally developed by Holley for the Fordson tractor. The method utilized consists in converting the kerosene into a gas, by applying to it some of the exhaust heat, and then mixing this gas with cold air. After passing the metering jet, the fuel, together with a small quantity of air, is drawn through the vaporizing tube, which is heated by exhaust gases. This vapor tube is in coil form, surrounded by the exhaust pipe, and the mixture which is drawn through it is too rich for combustion. After passing through the coil the mixture enters the carbureter at the throat of the venturi. Here it combines with the main air stream while the latter is at its highest velocity, and a combustible mixture is formed.

In installing the carbureter, it is mounted on the intake manifold in the usual position. Connected to the end of the exhaust manifold is a heater pot surrounding the vapor tubes, through which circulates all of the fuel used by the engine, but only a small proportion of the air. The exhaust gases heat the walls of the vapor tube sufficiently to vaporize any fuel that will evaporate below 600 deg. Fahr., it is claimed. This includes kerosene and any lighter fuels. For starting, a small tank with gasoline is coupled to the gasoline connection.

One of the features of the carbureter is the atomizer, which is a tube carrying air through its center and containing a series of jets arranged to be rotated in to register with either the starting fuel passage or the passage from the fuel chamber. This provides at the

same time a means for shifting from the starting fuel to the regular running fuel and means for adjustment of the fuel feed. The fixed size jets prevent the operator from getting away from a working mixture, but allow him to secure the best results, considering climate and altitude.

In operation, after running a minute or two, the pointer is turned to working position No. 1, which is the largest fuel jet, giving the richest mixture. As the engine warms up the pointer is moved until the smallest jet on which it will run properly is reached. The temperature attained by the vapor issuing from the tube is about 160 deg. Fahr. The main air supply is controlled by the air valve, which regulates the amount of air and fuel drawn through the vapor tube and atomizer and maintains a correct proportion of fuel at all speeds and throttle openings.

For idling, sufficient air is drawn past the side of the air valve, which lifts to admit more air under its lower edge as the motor speed increases. The air passing at idling speed is regulated by the idling adjustment. When this is closed the mixture is richest, because the amount of air admitted is then smallest.

THE Geological Survey has made public statistics of production of soft coal by machines in 1918, published for the information of the Federal Bituminous Coal Commission in advance of the appearance of the Survey's regular annual report for 1918. The number of machines in use was found to be 18,463, an increase of 1,228 over 1917, and 2,265 over 1916. Tonnage mined by machines was 323,931,000, an increase of 17,535,000 tons, or 5.7 per cent as compared with 1917.

What Led Up to the Unauthorized Railroad Strike?

This labor disturbance that seemed to spring up overnight without forewarning and seemingly without cause is seen by Mr. Tipper as a matter of labor politics. The actions of the Four Brotherhoods and of Mr. Gompers are seen as corroborating these thoughts and of giving point to them.

By Harry Tipper

THE one distinguishing feature in the labor situation to-day is the unauthorized strike of railroad employees, the speed with which this strike has spread all over the country and the extent to which it has crippled railroad facilities at a time when the utmost movement of commodities was demanded for the continuance of industrial operations. There are many things about this particular strike which are marked as unusual in recent strike annals. These indicate that its purpose has behind it more important matters than the usual wage demand, and that it is concerned more definitely with labor politics.

For the first time in recent strike history, the organizers of the strike appear to be unknown, and there were no demands before the railroads when the strike itself was called. The man Grunau, a conductor who was demoted to a yard man, figures as the head of a new union which is supposed to be backing the strike. On the face of it, this explanation is evidently for public purposes. There is no reason to suppose that a rival union to one of the Four Brotherhoods could have been operated and developed to such strength without drawing the attention of the Brotherhood presidents long before this time.

Furthermore, in some of its characteristics, the strike is similar to certain of the tactics of the I. W. W. and some of the men who have been interested in I. W. W. affairs have been very active in its promotion. The fact that it did not cover one specific operation but extended through several of the occupations on the railroad and involved in some cases three of the Brotherhoods makes the matter take on the atmosphere of the one big railroad union, which, of course, is the I. W. W. idea. In one respect, however, it differs materially from anything heretofore promoted by the I. W. W. It is impossible to find the leaders of the strike in any of the localities, except the man Grunau, who has been mentioned previously, and there has been an unwonted secrecy as to the whole matter which does not agree with previous developments from an I. W. W. standpoint.

While the regular Brotherhoods have repudiated the strike and have authorized all union members to aid in any way in breaking the strike, they have not indicated that any very serious steps were being taken to discipline the strikers who are members of the Brotherhoods, to remove their union cards or to disown them in any way. In fact, this delicacy of the leaders of the Brotherhoods in dealing with the strikers is another surprising feature of the development of the strike at the time that this is written.

In view of these unusual elements, it is interesting to recapitulate some of the recent history in connection with the railroad labor question. It will be remembered that some time ago the Four Brotherhoods formally adopted the Plumb Plan as their idea of railroad operation and used their influence to give that plan all the publicity and all the backing which it could secure. It is to be recalled that hearings were held upon the matter in Congress and that since the Plumb Plan was suggested, the railroad Brotherhoods have brought the wage question to the attention of the President, claiming that the men were getting restless and it might not be possible to hold them. This claim as to the restlessness of the labor on the railroads was made a good many times and was the reason for the demands upon Director Hines just before the roads were to be returned to their original owners. The leaders of the Four Brotherhoods have shown themselves to be astute politicians, as well as labor leaders, and their actions since the Government took over the railroads have indicated their capacity to seize upon every advantage and use it for the development of the unions which they represent. It will be remembered that one of them has recently joined the American Federation of Labor and the indications are that the others will affiliate.

To add to the unusual character of the strike, it is necessary to call attention to Mr. Gompers' statement in respect to it. In fact, Mr. Gompers is quoted as saying that "there is no strike, but of course there is no law to prevent men from quitting work."

Mr. Gompers is usually forceful and very definite, and where the prestige of the American Federation of Labor is concerned, he has not hesitated at any time to state his views without qualification and in a way which was unmistakable. This makes his acceptance of an unauthorized or outlawed strike a most peculiar attitude, and one not at all consistent with his own policy in such matters.

All these items indicate that this strike is not merely a part of the regular unrest which is occurring or merely a demand for increased wages or a larger share in the rewards of industry. Neither can it be considered as a spontaneous outburst on the part of dissatisfied labor. While it has some elements in common with I. W. W. strikes, it is not customary for the I. W. W. leaders to operate strikes secretly or to refuse to acknowledge their leadership. In general, the leaders of that radical organization have been very definite in their public statements, and very willing to utter their disagreement with present industrial developments at any time. They have never made any secret about their desires, and usually they have fomented strikes by inducing utterly unreason-

able demands and not by starting a strike without any demands at all.

There is no doubt that the restlessness among railroad employees has been increasing. They have had a taste of power and they had no desire to see the roads returned to their private owners. There is no doubt that the recent developments in increased rents, etc., have placed some classes of railroad labor at a serious disadvantage, because these classes did not share in the general increases adopted for the Brotherhoods at various times during the war.

Furthermore, there is no doubt that the railroad conductors, locomotive engineers and similar employees are intelligent, shrewd types of labor, with plenty of ability to see the advantage and use it when it is in their hands. It is quite likely also that the reports are correct in stating that the initial trouble arose over the transfer of Grunau from one post to another, and that this was the immediate reason for the starting of the trouble.

When the President of the American Federation of Labor, who has been fighting to increase the power of that Federation and its membership views the breaking away of so many members of unions in unauthorized action with such a calm spirit of development, it does not look as though the Federation was seriously disturbed by this new evidence of "radicalism" within the ranks of the most powerful union organization in the country.

From time to time, in these articles, the statement has been made that the action of trade unions could not be divorced from the ambitions and desires of the leaders, and the circumstances surrounding this strike made it advisable to examine the known evidence as to the ambitions of the leaders of the Four Brotherhoods. Un-

til just before the outbreak of the war in 1914, the railroad unions were counted among the most conservative. Their operations have been characterized by well-balanced consideration and by intelligence which could not be accorded to many other unions.

During the war and particularly after the Government took over the railroads, after the United States entered the conflict, railroad Brotherhoods began to show increasing signs of what is termed radicalism but what was really a shrewd desire to take advantage of the necessities of the case to consolidate their power and importance. On the eve of the conflict they engineered the Eight-Hour Bill.

After the roads were in Government control, they not only engineered further increases, but they were, of course, in a powerful place on account of the Government machinery for mediation. When it became apparent that some change in the situation was necessary after the armistice, they brought forward the Plumb Plan, which was adopted by the American Federation of Labor and which they undoubtedly hoped might be acceptable as a solution of the problem. Since that plan was turned down and since the failure of the first Industrial Conference, which was called with a large labor representation, the American Federation of Labor has publicly announced its intention of using its influence for the next election. Along with the Brotherhoods, it has denounced the bill, which has since become law, for the control of the railroads and has indicated that labor unrest was not to be cured in that way.

Under these circumstances, it would be unwise to estimate this strike as a sporadic outbreak of restlessness and as a purely outlaw attempt to divide the Brotherhoods, which have so far governed railroad labor affairs very completely and effectively.

The Immigrant To-day

SPEAKING before the National Conference on Immigration in New York recently, John E. Otterson, president of the Winchester Repeating Arms Co., and of the New Haven Chamber of Commerce, stated that before the war an average of 1,250,000 immigrants entered this country each year, and that since the war only one-fourth of this number have been coming over annually. He said also that five times as many have left this country since the signing of the armistice as had come in. Feeling that it was necessary to take effective steps to fill the unskilled labor gap, Mr. Otterson made several recommendations. They may be summed up as follows:

1. The National Government, in co-operation with American industry, should encourage and select immigrants.
2. Local agencies, such as chambers of commerce, civic associations, industrial leaders, etc., should take definite and effective steps to hold the immigrant once he has arrived.
3. They need chiefly human treatment; not Americanization of the "hymn singing" kind.
4. They should be taught English for the purpose of reducing the number of industrial accidents among foreigners, which is now twice as great as among native-born citizens; and so that they may understand what we say to them in every way.
5. Communities should render them service by protecting them from insults which often are offered by ignorant Americans and others who should know better, and by giving them educational, civic, legal and medical aid.

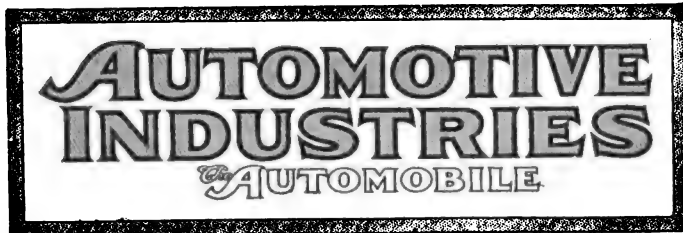
It is more important, the speaker said, that immigrants be made to understand and heartily receive our American ideals than that they be artificially hastened through the technical process of obtaining citizenship.

Petroleum Production Figures

IN a recent lecture before the Royal Institution, Sir John Cadman, Professor of Mining at Birmingham University, Birmingham, England, stated that the world's production of petroleum had risen from 38,000,000 tons in 1907 to 55,000,000 tons in 1914 and to 70,000,000 tons in 1918. To the latter figure the United States had contributed nearly 60,000,000 tons, the output of Europe being 5,500,000 tons, that of Asia 6,000,000 tons (mainly from Borneo, Burmah and also Persia); South America yielded 900,000 tons, and Africa perhaps 500,000 tons.

When the war broke out, the United Kingdom needed over 2,000,000 tons of oils of all kinds for various purposes, which had to be imported from the United States and from the East. The war demands for ship and omnibus propulsion, for lubrication, explosives, chemical manufacture, etc., rose steadily, and as up to 1917, each branch or section of oil users looked after its own interest, the position became so serious that the distribution was intrusted to one department under Mr. Walter Long.

In spite of all difficulties, oil imports into the United Kingdom—about 1,750,000 tons in 1912, and over 2,000,000 tons in 1917—increased to 5,500,000 tons in 1918; one of the main difficulties being to keep the available stock of oil below the danger line, so far as possible.



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Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907, and The Horseless Age (semi-monthly) May, 1918.

Tendencies of the Day

AN unusual news item, for these days, was printed in a recent number of AUTOMOTIVE INDUSTRIES. It told of an agreement of workers and management of an Indiana company for a longer hour schedule. No reader needs be told that the tendency recently has been the other way. Fewer hours of work have been called for all along the line. Overtime, even at a premium, has been spurned. So this item telling of a different situation at one plant is as welcome as the first bird of spring after a winter of deep snows.

Coincident with the publication of this item, appeared the report of the Federal Reserve Board, telling of many indications that the consumer was beginning to retrench, and that priced goods were not selling as freely as had been the rule. The report also noted a change in the attitude of business men—a natural sequence of the attitude of the consumer. In summing up, the Reserve Board said: "Through-out practically all of the reports runs a recognition of the existence of an overstrained condition of credit and of some continued tendency toward speculative

operations, while high living costs and the upward movement of prices have apparently not been checked, notwithstanding the decrease in prices of some classes of goods and a tendency toward restricted trade in specified lines."

The same week a weekly paper of one of the commercial agencies told of the failure of salesmen of high priced shoes to find customers. The shoe trade, it was stated, was good when measured by bulk but high priced footwear was not going to the dealers. They frankly were afraid to stock up on goods priced at figures so often seen in the show windows during the past winter.

Perhaps the tide is turning and perhaps you can help.

Drive Away on Railroad Tracks

SINCE the freight situation has become so bad that it is necessary to drive a large percentage of automobiles away under their own power, some better solution of the problem than driving these over the road should be considered. Were the roads of the country all concrete or macadam, the drive-away proposition would not be a bad one. But since it is necessary to drive the cars to all parts of the country, some with roads that are impassable at times, the possibility of utilizing the railroad tracks becomes of great interest.

It would be possible to make light, pressed steel flanged rims to slip on the wheel in place of the ordinary tire carrying rim, these flanges to fit the railroad tracks. The cars might be driven away in trains of three or four, in charge of a man who is familiar enough with railroad practice so as not to interfere with ordinary traffic.

If some such arrangement as this could be made, it would release thousands of freight cars needed for practically every manufacturing industry. It would be possible with the flanged railroad rim to reduce the number of drivers by 60 per cent, at least, and possibly by more. Furthermore, it would materially reduce the time necessary to drive the car to any particular destination. Where there are hard surfaced roads such as concrete, macadam or brick, this procedure would not be necessary. On the other hand, on some roads, in the South particularly, it appears to have advantages which should be carefully considered.

The investment in the flanged rims would not be high. They could be shipped back to the starting point and used over again indefinitely. During the winter when certain parts of the manufacturing districts are practically snow-bound as far as the roads are concerned, the railroad tracks are open. The freight situation is not one of a congestion of tracks so much as it is a congestion of terminals and a shortage of cars.

It is known that this plan has been tried out in an incomplete manner and that certain objections were found by the Interstate Commerce Commission. However, the matter should not rest at this if the

proposition appears to have any value at all, as the railway situation is so acute that every possible means of relief should be studied carefully.

Theory of Tractor Stability

SOME tractor engineers seem to persist in the belief that, when the front end of a tractor is raised from the ground, the pivotal axis is along the line of ground contact of the wheels and that the chief factor in causing the front end to raise up is the movement of the drawbar pull around this pivotal axis. The fallacy of this theory can be clearly demonstrated. Of course, it is possible to conceive of a tractor so arranged and so placed that a vertical line through its center of gravity falls back of the line of ground contact of the rear wheels, and the tractor then will topple over backward under the force of gravity if frame and wheels are locked, as by having the low gear in mesh, the clutch in and the engine dead. This, however, applies not only to a tractor, but to any freely supported object; that is, if a vertical line through the center of gravity falls outside the supporting base the object will fall over. The likelihood of such conditions occurring in tractor plowing is so remote that the case may be dismissed without further thought.

In order to raise the forward end of the tractor any appreciable distance from the ground, mechanical work must be done. There are only two sources of energy which can be drawn upon. One is the kinetic energy stored up in the moving tractor. If this comes into play the resulting force acts through the center of gravity of the machine and in the direction of travel, and such a force certainly does not tend to raise the front end.

The only other source of energy is the engine, and the engine can do work only if there is relative motion between the driving wheels and the frame. Work on energy is composed of two elements—force and distance—and without such relative motion one of these elements, distance, is lacking. In order that there may be relative motion between wheels and frame, either the wheels must roll forward over the ground—in which case there can be no question of the tractor rearing around the line of ground contact—or the frame must be turning backward around the wheel axis. It is this latter action that actually takes place. If the drawbar extends beneath the driving axle, as is usually the case, the drawbar pull tends to prevent the front end from raising up, and it is a fact that some of the authenticated somersaults of tractors occurred when no load was being pulled.

CONGRESS has heard the cry of economy and has attempted to heed it. But a lack of business knowledge has hampered the first attempt, that of cutting off appropriations for foreign trade investigations. Business spoke promptly and firmly and this excellent branch of service will continue. At the same time business will speak promptly and firmly in favor of cutting off useless employees.

The Functions of Employee Service Work

IF the evil results of ill-conceived and poorly operated "welfare" work accrued to no one except organizations which instituted it, its failure would be of little interest to any one outside of that particular organization. Unfortunately, however, this is not the case. Only the fact of the welfare work itself, together with the results which it produces, is known outside the plant; thus, a failure of one employee service or welfare plan, due possibly to the spirit in which it was conceived and the method in which it was carried out, becomes a current argument outside of the plant against such plans and such work in general. The real reason for the failure is neither understood nor investigated.

When one plant institutes welfare work as a substitute for just piece rates reasonably maintained, or for fair wages and hours, failure is not attributed to this fact but to the uselessness of such work in general. When asked recently why his plant had been able to obtain a low turnover; why it had been comparatively free from labor trouble in general, the production manager of a large Detroit automobile concern said:

"We treat our men squarely; we work a 48-hour week, maintain piece rates and treat our men as we would expect to be treated if we were in their place. We do not do any welfare work, however. That square treatment may be the reason our labor policy is a success. But here is the Blank plant across the way. They treat their men fairly and do all kinds of welfare work. Still they have strikes, labor troubles and a high turnover. So it is hard to say why we have not had trouble. It is hard to attribute it to any one thing."

A subsequent investigation of the Blank plant, however, showed not only that there was totally inefficient organization of the personnel department, but the practice of cutting piece rates was a current one, and that the plant worked in two shifts, one of 11 hr. and one of 12 hr. daily. The Blank plant, in brief, was attempting to use employee service work as a substitute for something else. The work was, of course, a failure.

The more competent employment managers of the automobile plants believe in general in the efficacy of employee service work if it is used as an addition to a constructive policy, but they are almost a unit in declaring that the work will be unsuccessful if an attempt is made to use it as a substitute for other necessary things.

In the case of the Blank plant, as in some others, failure of the employee service work was being attributed by outsiders to the uselessness of the work itself. The real reason for the failure lay elsewhere—in the fundamental incorrectness of the company's policy toward its workmen.

The employer, using wrong personnel methods is a menace to good industrial relations, not only in his own plant but in all the plants of his vicinity. Charity does not cover a multitude of sins.

Production Extends Despite Handicaps

N. A. C. C. Sees Little Hope of Relief from Freight Congestion This Year

NEW YORK, April 10—Though transportation conditions are worse than at any time in the history of the automobile industry, tremendous increases in production are reported. At a meeting of National Automobile Chamber of Commerce directors this week, it was shown that shipments for March would approximate 28,000 carloads, compared with 23,744 carloads in March, 1919. In addition to this, 46,000 cars, or about 13,000 carloads, were driven away from the factories during March.

Shipments for January and February of this year totalled 46,812 carloads, compared with 36,191 in the same period last year. In these two months of 1920 the drive-aways from factories numbered 57,482 machines of an added 16,500 carloads. One Ohio manufacturer reported that he had driven away 600 cars in one day last month, while one from Detroit reported a drive-away of 500 in one day.

It was pointed out that there are in the country only 90,000 automobile freight cars, and that a third of these are owned by the New York Central lines. Now that railroads have gone back to private control it is difficult to get wide distribution of these cars. The directors of the N. A. C. C. believe manufacturers might as well make up their minds that it will be necessary for them to drive away from their factories a large part of their product all this year.

Considerable improvement in the transportation situation has been brought about through the activities of the traffic committee of the Chamber, which has brought pressure to bear on the railroads to expedite automotive shipments. In this respect the automotive industry is in much better position than others, because it is not absolutely dependent on the railroads.

Would Sell Manufacturers Bonds

One interesting announcement at the meeting was that a large railroad has approached automobile manufacturers with the proposal that they buy its 6 per cent certificates with the understanding that the proceeds of the sale would be used for the purchase of automobile cars. The N. A. C. C. has been asked to lend its influence to the project, but the subject was referred to the traffic committee.

The directors sanctioned plans which have been made to interpose the most strenuous objections to the proposed increase in freight rates to the Pacific Coast, which would result in an increase of from \$150 to \$200 a carload on shipments of passenger cars, and from \$250 to \$400 on trucks. Traffic experts have been retained to assist in combating the proposed rates. The Motor Car Dealers Association of San Francisco has offered

its co-operation, and Pacific Coast dealers are greatly incensed over the rates proposed.

The directors authorized the holding of a service managers' convention at Indianapolis the last of May. The recently organized service division, headed by H. R. Cobleigh, has called a meeting at Detroit for April 14 to map out a plan of campaign.

A representative of the Chamber will be sent to the meeting of the National Industrial Conference Board at Chicago, at which revision of Federal taxation will be considered.

Resolutions of respect were adopted on the death of Elmer Apperson, one of the oldest members of the organization.

Convention to Discuss Gear Standardization

DETROIT, April 10—Standardization in the manufacture of gears is one of the important subjects to be discussed at the fourth annual meeting of the American Gear Manufacturers Association, which will be held here April 29, 30 and May 1. An entire day of the convention will be devoted to the various angles of this subject and reports will be given by committees which have had it under consideration for months.

An interesting program has been arranged which will include papers on such subjects as "Gears from a Purchaser's Standpoint," by D. G. Stanbrough, of the Packard Motor Car Co.; "Routing of Gears and Machine Parts Through the Factory," by J. A. Urquhart, of the Brown & Sharpe Mfg. Co.; "The Science of Manufacturing," by Henry M. Leland, president of Lincoln Motors Co.; "Problems of the Gear User," "Mill Gearing from the User's Standpoint" and other phases of gear manufacturing.

AIRCRAFT OFFICIAL RESIGNS

NEW YORK, April 10—Holt Thomas, chairman of the Aircraft Mfg. Co. of England, according to information received here, has resigned his chairmanship of the concern, the future of which, as an aviation company at least, is more or less clouded. The company recently was absorbed by the Birmingham Small Arms, Ltd., which, according to a statement made by Thomas, may intend to devote the Aircraft company works to the building of automobile bodies and similar engineering work. The Aircraft company is known by the name of Airco and now operates an aerial express and passenger line between London and Paris on regular schedule.

FORD STARTS BLAST FURNACES

DETROIT, April 10—Blast furnace operations at the Ford River Rouge Plant was begun this week. Henry Ford, Jr., grandson of Henry Ford, officiated at the ceremony, lighting furnace "A." The full limit of 500 tons of metal daily is expected to be reached within a short time.

New Franklin Truck Nears Completion

Embodies Air-cooled Features of Passenger Car—First Deliveries in May

SYRACUSE, N. Y., April 10—The first air-cooled pneumatic-tired truck will be an accomplished fact within a few weeks, according to James L. Yarian, chief engineer for the motor truck department of the H. H. Franklin Mfg. Co., who states that the designs for the new 1-ton model are 95 per cent complete.

Many of the features of the Franklin car are embodied in the truck, including besides the air-cooling system the wooden frame. High-speed transportation is the idea back of the design. The engine is a 4-cylinder type with large bearing surfaces lubricated by pressure. The transmission is a unit with the engine, and has 3 speeds forward and 1 reverse. It is small and compact, but of stout construction.

The front axle is the built-up Franklin type and is of heat treated nickel steel. The weight of the rear axle is but 175 lb. Helical bevel gears are used for the final drive. The differential is of the locking type, made to take care of ruts, mud, ice and snow. There are no grease cups on the chassis, and all spring and axle pins are lubricated by wicks from oil reservoirs designed for refilling only every 8000 to 5000 miles.

A variety of bodies to meet all classes of work will be made to order. Weather-proofing the driver's seat is a feature, as is also the provision of electric lighting and starting systems.

F. W. D. DEVELOPS FIRE TRUCK

CLINTONVILLE, WIS., April 12—Announcement is made of the development of a new 3-ton fire truck by the Four Wheel Drive Auto Company. The new apparatus contains an unusually powerful special type J Wisconsin motor, with a 5.1 in. bore and a 5.5 in. stroke, developing 42 hp., S. A. E. The type B rotary pump, driven through a two-speed transmission, has a capacity of 500 gal. at 120 lb. pressure.

JONES TO RESUME PRODUCTION

WICHITA, KAN., April 9—Completion of the new factory buildings of the Jones Motor Car Co. is expected by May 10. Normal production will be resumed at that time. Though handicapped by the fire damage of February and an increase in prices of \$500 a car, the company reported record business for March.

BRITISH COLUMBIA PLANS ROADS

VICTORIA, B. C., April 10—Announcement was made, March 30, by the Provincial Minister of Public Works, that approximately \$8,000,000 will be expended on highways in the province during the next three to four years.

Timken Gets Listing on Detroit Market

Outstanding Common and Preferred Stock Offered—To Reduce Par on Common

DETROIT, April 10—Timken-Detroit Axle Co. has been listed on the local stock exchange, the application having received unanimous approval of the board of governors. The listing will be of the corporation's outstanding issue of \$3,000,000 common of the par value of \$100 and \$5,000,000 of 7 per cent cumulative preferred.

The financial statement accompanying the application shows assets of \$22,697,213, with a surplus at the end of 1919 of \$10,175,519. The company's authorized common stock is now \$30,000,000 and preferred \$15,000,000. This, taken in connection with the surplus, gives grounds for the reports in financial circles of a proposed stock dividend. The common soon is to be reduced to \$10. Another item of unusual significance is the fact that goodwill, patents, etc., are listed in the company's report at only \$1.

An appropriation of several million dollars to provide for additional buildings, equipment and machinery to provide for a 50 per cent increase in output for 1921 has been made and part of the additions have been built or are in course of construction. The company proposes to produce in its own factories more of the material going into its finished product, assuring its customers greater efficiency in the operation of its product.

Development of the corporation is reflected by its dividend records since the organization in 1909. Beginning with 1910, up to and including the first two months of 1920, the company distributed common stock dividends totaling \$7,437,957.50. This was in cash, with the exception of a 200 per cent stock dividend in 1914. During the same period \$599,836.75 in interest was paid on preferred.

Timken Roller Bearing Co., one of its chief supply sources, now is operating two separate factories, insuring uninterrupted production of axles in case of accident at one plant.

SIMMS MOTORS TO BUILD CAR

ATLANTA, April 10.—The Simms Motor Car Corp. has been organized with a capital of \$2,500,000 and announces that it proposes to erect a factory here at a cost of \$250,000. The company, which is headed by Thomas H. Mars, proposes to manufacture a popular priced car and the initial production is expected to be about 25 a day, Mars says.

M.-P. TO DISCONTINUE TRUCK

NEW YORK, April 12—Stockholders of the Martin-Parry Corp. are expected to ratify a proposal to sell the company's truck business to a new corporation. The chief business of the company is the building of automobile bodies but so many orders for Atlas trucks have been

received of late that President Watson feels the operation should be segregated.

It is expected that a company, known as the Atlas Truck Co., will be formed with 100,000 shares of no par value stock to take over the truck business. It will pay Martin-Parry about \$250,000 in cash for materials, etc., and a block of stock. This stock, it is intended, will be distributed to Martin-Parry holders who will also be given an opportunity to subscribe to additional shares of Atlas Truck stock. In all about 60,000 shares of the truck company's stock is to be issued and the amount offered for subscription will be underwritten.

To Build Front Drive

G. J. Hoskins, of New South Wales, and his sons, L. P. Hoskins and E. J. Hoskins, are at present in this country to develop a front drive for automobiles, the invention of the elder Hoskins. An experimental car is being built at Los Angeles.

De Palma to Drive Ballot in Sweepstakes

INDIANAPOLIS, April 10—Ralph De Palma has signed to drive a Ballot in the eighth annual 500-mile race to be held at the Indianapolis Speedway May 31. His team mates in the big race are not announced, nor are any details of his car except that it will be of 180 cu. in. piston displacement, 8 cu. in. inside the limit specified, and that it will be a 1920 model.

Last year De Palma drove a 12-cylinder Packard and, despite persistent engine and tire trouble, finished sixth. This year he is riding a Ballot—"because he wanted something distinctive," as he expressed it.

G. M. C. TRUCK PRICES RISE

NEW YORK, April 12—General Motors announces the following increases in the prices of its trucks:

	New Price	Old Price
1 ton truck	\$1,725	\$1,559
1½ ton truck	2,650	2,500
2 ton truck	3,100	2,950
3½ ton truck	4,150	3,950
5 ton truck	4,750	4,550

FRANCE BUYS CZECH PLOWS

NEW YORK, April 12—Reports from Paris say that Laurin and Klement, the largest automobile concern in Czechoslovakia, received an order from France, amounting to 1,000,000 francs, for Laurin and Klement "Excelsior" motor plows. These plows entered competition with 75 other types manufactured in other countries during tests held in Senlis, France, last September and proved highly adaptable for usage in French agricultural work.

Future Fuel Supply in Oil Bearing Shale

Secor, Consulting Engineer, Tells Chicago S.A.E. of Possible Developments

CHICAGO, April 10—"Through proper development the large deposits of oil bearing shale can be made a practically invulnerable bulwark of oil supply and this development will of necessity have to take place should the price of fuel and its output continue to diminish as rapidly as it is doing now," was the statement of John Secor, consulting engineer of the Advance Rumely Company, at a meeting of the Midwest Section of the Society of Automotive Engineers last night.

Mr. Secor addressed the society on the subject of kerosene as a tractor fuel and diverted just enough to give those present a slight conception of what was in store for the future generations should the supply of petroleum fuel become exhausted. D. Stockfleth and N. G. Anderson, truck engineers of the International Harvester Co., presented a joint paper on "Truck Maintenance," together with a series of questions which had a bearing on the subject of truck design as it affected service.

There was an interesting discussion on Mr. Secor's paper. President Horning of the Waukesha Motor Company, Waukesha, Wis., talked about the fuel problem as it affected the design of the combustion chamber. He said in a half serious and partly humorous way that they had just found out that one factor which governed the successful burning of kerosene fuel was that any surface within the combustion chamber must not be parallel to its opposite surface.

Time limited the discussion on the paper on truck maintenance. L. W. Pietsch of the Standard Oil Company, responsible for the maintenance of 5800 trucks and 6000 passenger cars throughout the United States, said he hoped to see the day when, in the event of an engine breakdown on the road, the factory service branch could meet the truck and slip in a new engine. Pietsch said that this could easily be brought about by placing the engine on skids, so that by undoing a few thumb screws the radiator core could be lifted out and the engine slipped out through the shell.

Pietsch characterized as ridiculous a design where a high pressure tire pump, for truck pneumatics, located on the transmission could be gotten at only by lifting up the seat and the floor boards should it happen that the air line should blow off from the pump.

PRESENT ADVERTISING BILL

INDIANAPOLIS, April 12—A plan for a Federal Department of Advertising, presented in the form of a proposed bill creating it, will be offered at the convention of the Associated Advertising Clubs here, June 6 to 10, the program committee announces.

Maxwell-Chalmers Merger Nears Close

Rumor that Hupp Is to Be Included in Deal Lacks Confirmation

NEW YORK, April 12—Final consolidation of the Maxwell and Chalmers interests may be expected by May 1, it was said to-day at the offices of J. S. Bache & Co. It will be preceded by an optimistic financial statement by W. Ledyard Mitchell, president of the Maxwell Co. Little remains to be done to complete the merger.

The Chalmers Motor Corp. voted on Sept. 10, 1917, to adjust its capitalization and lease its plant for five years to the Maxwell Motors Co. A merger with the Maxwell interests was proposed in October, 1919. Jules S. Bache, J. Horace Harding and Hugh Chalmers were appointed a committee to act with James C. Brady, John R. Morron and Elton Parks, representing the Maxwell Co., to work out the details of consolidation.

Negotiations were begun with the Board of Governors of the Stock Exchange and permission was granted to list on the Exchange \$969,000 worth of first preferred stock, \$3,215,000 of second preferred and \$250,000 of common. No change is probable in this allotment of stock but no announcement has been made as to what will be given the present stockholders of the two companies. The new corporation will be known as the Maxwell Motors Co., Inc., or the Maxwell-Chalmers Motor Corp. The present Maxwell organization was built up out of the wreck of the old United States Motors Co.

Reports have been current that the Hupp Motor Car Corp. might be included in the Maxwell-Chalmers consolidation but they apparently are without foundation. The banking interests which represent the company in New York said to-day they had no knowledge whatever of such a plan. It was stated, however, that they did not know the interests responsible for the tremendous volume of trading in Hupp stock in the past few days. There is a large amount of Hupp stock in the open market and it has not yet been determined whether an attempt is being made to buy a controlling interest. No formal amalgamation negotiations are under way, however.

Many Mergers Rumored Near

Wall Street has been filled of late with rumors of impending automobile consolidations but they appear to be more or less ephemeral. Some of them have to do with additional purchases by General Motors and others with another tremendously larger merger. No firm foundation can be found for any of them.

The end of the flurry caused by the corner in Stutz stock is not yet in sight. Allan A. Ryan is standing pat and the short interests have retained attorneys to represent them in legal proceedings, which appear imminent. The business conduct committee of the Stock Exchange

has announced that it proposes to investigate the long and short interests in Stromberg Carburetor, another of the so-called Ryan stocks. It has risen rapidly of late but there is no intimation that ruling it off the exchange is contemplated.

Ryan recently was re-elected a director of the Bethlehem Steel Corp., which would seem to dispose effectually of reports that he had had a disagreement with Charles M. Schwab. Both men are heavily interested in Vanadium Steel, which has been taking on new values in the market of late.

British Manufacturers Study Production Here

NEW YORK, April 12.—In the expectation of gaining much valuable information concerning American production methods, a party of English and Scotch manufacturers have arrived here to make a tour of large American factories. They are particularly interested in standardized daily and quantity production as well as economies which have been effected on this side of the Atlantic.

The party includes Samuel Mehan, managing director, and J. Y. Moyes, factory superintendent, of Mechans Ltd., Glasgow, manufacturers of steel frames and sheet steel; Arthur Green, managing director, of the Coventry Repetition Co., Coventry, manufacturers of automatic machinery and small parts; F. W. Witherell and A. W. Hubble of the Willys-Overland-Crossley, Ltd., of Manchester, and J. R. Garner, managing director of Lancaster Ordinance Accessories Co., Ltd., manufacturers of forgings.

PREST-O-LITE TO BUILD HOMES

INDIANAPOLIS, April 10.—To obtain sufficient housing for its employees the Prest-O-Lite Co., located in Speedway City, west of Indianapolis, is planning to build industrial homes, a new hotel and a community center. Labor turnover has brought the Prest-O-Lite executives to a realization that they must go into the home-building business to meet business demands.

The Prest-O-Lite Co. expects to double its capacity by July 1. Plant improvements costing \$500,000 are nearing completion. One of these is a big foundry. Other buildings for handling the battery business of the company are under construction. Several of the old buildings are being remodeled and several re-equipped.

KNOX TIRE PLANT PROGRESSES

MT. VERNON, OHIO, April 12—Factory construction for the Knox Tire & Rubber Co., near this city, is progressing slowly. The structure will be 225 x 125 ft., three stories and basement. It will be of steel, brick and concrete construction, and will cost \$170,000. The company has purchased a complete line of tire making machinery. It is expected to have the plant ready for operation by July 1 at the very latest.

Acason Brings Out New Truck Models

Series Will Carry Changes in Assembly—New Prices Go Into Effect

DETROIT, April 10—The Acason Motor Truck Co. has brought out a new series of assembled models of 1, 1½, 2½, 3½, and 5-ton capacities. In connection with a number of changes in the make of component parts, a new price list goes into effect with the appearance of the new trucks. These trucks include the new Waukesha engine, Timken axles, Eisemann magneto with impulse starter and Marvel carburetor. The gearset is a Cotta, mounted amidship, and the propeller shaft and universal are the product of Blood Brothers. The steering gear is Ross and lubrication is by the Alemite system.

The 5-ton model has an engine rated at 60 hp., 5-in. bore and 6¼-in. stroke. It is governed for a road speed of 14 m.p.h., and has a low gear reduction of 55 to 1, standard, and 60 to 1, optional. The wheelbase on the standard chassis is 187 in., and on the dump chassis, 172 in. Tire equipment is solid, on Smith steel wheels, 36 by 6 in. front and 40 by 6 in. dual rear. The list price is \$5,850. Giant pneumatics, 40 by 12 in., can also be furnished for the rear.

Following are the chief specifications of the other models:

Three and one-half tons: engine, 4½ by 6½ in.; wheelbase, 187 in.; price, \$4,900.

Two and one-half tons: engine, 4½ by 5½ in.; wheelbase, 150 in.; tire equipment, 36 by 4, single, front, 36 by 8, single, or 4 in. duals rear. List price \$3,850.

One and one-half tons: engine, 3¾ by 5½ in., four-speed gearset and governed for a road speed of 18 m.p.h. The list price is \$2,650.

The 1-ton model is rated at 38 hp., also, with the same engine as the 1½-ton, but with three-speed gearset. It has a governed road speed of 20 m.p.h., and is listed at \$2,400.

SIMPLEX BODY TO MOVE PLANT

PHILADELPHIA, April 12—The Simplex Manufacturing Co., Conneautville, Pa., manufacturer of motor truck bodies, J. J. Hewit, superintendent, has leased for five years the building at Mercer, Pa., formerly occupied by the Reznor Manufacturing Co. It will establish its factory there.

SPARKS-WITHINGTON BUILDS

JACKSON, MICH., April 10—Construction work on a four-story building for the Sparks-Withington Co. is under way, and improvements to the plant, known as unit No. 2, also are being made. A second story, 50 x 320 ft., is being added to the main factory building.



Truck Builders at the Timken Convention in Detroit

Officials of all companies using Timken axles gathered at the Detroit Athletic Club recently to discuss new phases of commercial vehicle building. The convention agreed that the present system of rating trucks was the only practicable method of defining the weights they should carry

Imports Far Exceed British Car Exports

**Tires Only Part Showing Approximate Trade Balance—
Tractor Exports, \$50,000**

LONDON, March 23. (*Special Correspondence*)—In February Great Britain exported 169 vehicles, and 77 vehicle chassis, having a combined value of \$877,360 (pre-war rate of exchange). The export of chassis parts had a value of \$659,480. Tractors appear for the first time separated in the list of exports. The value of these exports was \$50,000 and of tires of all kinds, \$2,225,495.

The corresponding motor imports for February were as follows: Number of vehicles 2,482, chassis, 898, of the combined value of \$5,969,930. Parts valued at \$3,405,450. Tractors valued at \$190,995 and tires of all kinds \$2,482,555. These figures show the little headway the British export motor vehicle industry so far has made, and correspondingly that Great Britain is importing at the rate of 40,500 chassis yearly.

The British export of motorcycles and parts during February had a value of \$533,650 and the corresponding import value was \$127,610.

STUTZ COMPLETES ADDITIONS

NEW YORK, April 12—Stutz Motor Car Co. will have completed by summer additions to its plant which will provide facilities for turning out 7,500 cars a year. Production for 1920 is estimated at 5,500 cars.

EVERY ADDS TEXAS BRANCHES

SAN ANTONIO, TEX., April 10.—According to J. B. Bartholomew, president of the Avery Co., Peoria, Ill., the demand for farm machinery and implements in Texas is greater than ever before. Bartholomew has been making a

tour of Texas, visiting branch houses of the company. He says that two new and large branches are to be established at Amarillo and San Antonio.

According to Bartholomew, the branch house in San Antonio will be large enough to handle the requirements for southern Texas and also all of the export business in Mexico. At the present time the company has a branch in Dallas, which takes care of the business in the northern part of the state, but because of the immense area covered by Texas, two branches are deemed advisable. At the present time the Avery company is represented in San Antonio by the Alamo Iron Works.

Nash Motors Sued for Commission on Trucks

MILWAUKEE, April 10—Chipman, Ltd., London, England, filed suit in the Circuit Court at Milwaukee against the Thomas B. Jeffery Co. and the Nash Motors Co., Kenosha, Wis., to recover \$880,000 alleged to be due as commission on motor car and truck sales. The complaint avers that it entered into a contract with the Jeffery company on Jan. 23, 1914, under which it was to have the sole right to sell Jeffery products and parts in Europe, England, Australia, South America, Mexico and other nations. The Nash company is a party since it took over the business of the Jeffery company after the contract was made. It is charged that the defendant violated the agreement and sold trucks to the Russian, English and French governments between Nov. 16, 1914 and July 31, 1915, to the value of \$4,000,000.

GARFORD SERVICE AT BRIDGE

NEW YORK, April 12—The Garford Motor Truck Co. is completing plans for the erection of a 12-story service and repair building to occupy the entire block front on the Bridge Plaza, Long Island City.

Truck Show Problem in Committee Hands

**N. A. C. C. Assigns Members to
Study Situation and Suggest
Demonstration Means**

NEW YORK, April 10—George M. Graham, general sales manager of the Pierce-Arrow Motor Car Co., and R. H. Salmonder, vice-president and general manager of the Selden Truck Co., have been appointed a committee of the National Automobile Chamber of Commerce to investigate all phases of the motor truck show question.

A majority of the committee appears to be strongly in favor of holding shows, but expositions of the action type, separate from displays of passenger cars as in the past. It is felt that motor trucks should convey the idea of transportation to the last degree and that this cannot be done unless they are shown in action.

While Graham has an open mind on the subject, he is at present in favor of shows held under cover and believes buildings of adequate size to house them should be found. He would have seats provided for spectators where they could sit and watch trucks put through their paces, showing just what could be accomplished in loading and unloading as well as their manifold uses.

The committee also will take up the number of shows which should be held and their locations. One of the first steps to be taken will be to get in contact with the Motor Truck Sales Managers Association.

EXPORTERS TO MOVE

NEW YORK, April 10—The J. B. Crockett Co., automotive exporters, will move from the present location at 44 Whitehall Street to 15-17 East Forty-ninth Street, May 1.

Oil Producers Seek Greater Power Fuel

First Meeting to Discuss Gasoline Situation Disperses Rumors of Abnormal Advances

NEW YORK, April 10—As a preliminary to co-operative efforts which it is hoped will result in a solution of the gasoline problem, representatives of the National Automobile Chamber of Commerce, the Society of Automotive Engineers and the American Petroleum Institute met this week for conference.

Much research work and investigation remain to be done before any conclusions can be reached. The first meeting was given over to a general discussion of the situation from the viewpoints of those who use gasoline and those who produce it. Both interests decried sensational reports that "50-cent gas" is imminent. Such stories have no basis in fact, it was asserted, and the sole result is an incentive to profiteering.

The petroleum men explained that crude oil is the basis upon which prices of gasoline, kerosene and all the other by-products are based. One problem is the larger use of crude oil resulting from the steady increase in oil burning machinery.

Stocks of gasoline are lowest in October after the summer months when touring is at its height, and largest in January when fewest motor vehicles are in operation.

Representatives of the oil producers disclosed the fact that they are now engaged in research work which they hope will result in the finding of some formula which will give greater power and a greater proportion of gasoline production from a gallon of crude oil. They declined to tell in detail what these experiments were.

Those who attended the meeting were: W. H. Isom of the Sinclair Refining Co., R. D. Leonard of the Atlantic Refining Co., and J. L. Smith, secretary of the American Petroleum Institute; Alvan Macauley, president of the Packard Co., Windsor T. White, president of the White Co.; H. H. Rice, vice-president of General Motors, and Alfred Reeves, general manager of the N. A. C. C.; H. L. Horning, Coker Clarkson, and Mr. Hill of the S. A. E.

LABOR STATISTICS

WASHINGTON, April 10—Statistics regarding employment in automobile establishments in December, 1918, and December, 1919, have been made public by the Department of Labor.

The comparison of employment in identical establishments in December, 1918 and 1919, shows that in 39 automobile establishments there were 101,729 on the pay roll in 1918, and 129,075 in 1919, or an increase of 26.8 per cent. In 1915 the pay roll was \$2,723,904, as against \$3,946,728, an increase for the later period of 44.9 per cent. The percentage of increase in the number on the

pay roll is greater in the case of the automobile industry than in any of the other twelve industries surveyed, while the percentage of increase in the pay roll is greatest in the mens' ready-made clothing, which increased 96 per cent, with woollens second with 58 per cent. The comparatively small number of employees in these two groups has much to do with the percentages.

The comparison of employment in November and December, 1919, shows that out of the 44 manufacturers reporting, a total of 133,704 employees were on the pay roll in November and 130,351 in December, or a loss of 2.5 per cent. The pay roll in November was \$4,207,402, as against \$3,975,884 in December, or a decrease of 5.5 per cent.

Renault Tanks to Aid Mountain Climbers

NEW YORK, April 10—Visitors to the White Mountains the coming summer will be able to climb to more or less dizzy heights seated on the back of a baby tank, according to an announcement of the Renault Co. From the tank it will be possible to view mountain scenery which would be inaccessible without the exertion of toiling up rock strewn cliffs. The use of baby tanks for this purpose was begun in Switzerland a year ago. The Renault factory is turning out highly mobile machines which "can climb like cats" with their creeping tread and low center of gravity, over rough, broken country and through woods.

MOTOR WHEEL OUTPUT GROWS

MILWAUKEE, April 10—The Briggs & Stratton Co., Milwaukee, has completed additions affording 100,000 additional feet of floor space, which will be devoted largely to the production of the Briggs & Stratton motor wheel. Since April 1 the production has been increased from 75 a day to 100, and by May 1 it is hoped to reach an output of 200, so that a schedule of 28,000 wheels for 1920 may be accomplished. The device originally was designed and manufactured by the A. O. Smith Corp., Milwaukee, which sold the exclusive patents and rights to the Briggs & Stratton Co. about a year ago. It embraces a motorcycle type of gas engine for attachment to the ordinary bicycle, or use in a buckboard type of miniature motor car for sport.

BRITISH SEEK ITALIAN TRADE

LONDON, March 23 (*Special Correspondence*)—The attention of the British motor trade has been called to the scope and market in Italy for a light car of about 10 hp. The Italian trade does not cater to this class of vehicle, and it is believed that the introduction of a few samples—listed as chassis, as complete cars are debarred—would find ready market in certain of the larger Italian cities and towns.

All-Weather Plant Under New Control

Production of Cleveland Company to Be Tripled Under Reorganization Move

CLEVELAND, April 10—The manufacture of automobile tops is to be greatly enlarged in this city by the All-Weather Top & Body Co., which has been organized and has taken over the plant of the All-Weather Top Co., 6545 Carnegie Avenue.

The company has an initial capitalization of \$500,000 of preferred stock and 10,000 shares of no par common. All the patents, trade rights and business of the old company have been acquired, and arrangements made for tripling the capacity by building additions.

Organizers of the corporation are all well known in Cleveland automobile circles. Joseph W. Hayes, president and general manager of the new company, formerly was with the Fisher Body Co. of Detroit; Harry W. Anderson, general sales manager of the Templar Motors Corp., is vice-president; Fred H. Caley, secretary of the Cleveland Automobile Club, treasurer; C. E. Mellen, of Orgill, Maschke & Mellen, secretary, and A. R. Davis, of the Davis-Kenny Motor Co., a director.

Manufacture of an improved type of automobile top is now under way and production of automobile bodies will be started as soon as space is available, according to Hayes.

MARTIN TRIPLES FOUNDRY

MILWAUKEE, April 10—The A. E. Martin Foundry & Machine Co., 705 Park Street, Milwaukee, a large maker of cylinder and piston castings for the automotive industries, is erecting additions which will increase its capacity about 300 per cent. A new cupola with a daily capacity of 50 to 60 tons will be installed. The plant was doubled in size last summer and fall. Motor manufacturers in all parts of the United States, Canada and England have provided a relatively enormous volume of business which will keep the plant busy for more than a year.

DOELGER ADDS MACHINE SHOP

MILWAUKEE, April 10—The Doelger & Kirsten Co., Milwaukee, manufacturing metal cut-off tools and other metal-working tools, has started work on the erection of a new machine shop, 90 x 210 ft. The investment will be about \$100,000 in building and equipment. It is to be ready about June 1.

PACKARD BUYS BROOKLYN SITE

NEW YORK, April 10—Packard Motor Car Co. has purchased the block front on Bedford Avenue, between Sullivan and Malbone streets, Brooklyn, with a frontage of 200 ft. on Bedford Avenue, and will erect a three-story ornamental building to be devoted to showrooms and sales departments.

High Speed Camera Shows Truck Action

Metropolitan Section of S.A.E. Has Opportunity to Test Mathematical Conclusions

NEW YORK, April 9—Mathematical calculations as to what happens to a motor truck or its load under given traveling conditions were somewhat upset by the high speed camera last night at a meeting of the Metropolitan Section of the Society of Automotive Engineers in the Automobile Club.

The subject assigned to the meeting was "Tire Deflection and Unsprung Weight in Trucks." The speakers, A. F. Masury, chief engineer of the International Motor Co., and Capt. L. C. Josephs, Jr., also of International, used the camera to illustrate points in their talks.

Many of the engineers for the first time were able to visualize, by these means, the actual results of heavy jars and vibrations. In a number of instances the results were far different than mathematics had indicated. Trucks equipped with both solids and pneumatics were shown under similar traveling conditions.

The meeting and the dinner which preceded it, was attended by 200 members. Discussion followed the addresses. On April 30 the same talk will be given before the Detroit Section by M. C. Horine, of International.

SPAULDING ADDS TO PLANT

NEWARK, N. J., April 10—The Spaulding Chain Corp. has taken over additional buildings formerly occupied by the International Arms & Fuse Works. This expansion quadruples the size of the original Spaulding factory and provides for increased production. With this addition the Spaulding plant becomes one of the largest of its kind in the country. The full quota of production scheduled for the month of February was attained, and the event was marked by a general celebration.

FOX MOTORS BUYS PLANT SITE

PHILADELPHIA, April 12—The Fox Motor Car Co. has purchased a site for a steel and concrete factory, three stories high, on the main line of the Philadelphia & Reading Railway, above Tabor Junction. Plans are being prepared by the company's own engineers which call for a building 80 x 400 ft., to cost approximately \$850,000. Other units of construction will follow. The plant, it is announced, will have an output of 2000 cars for the first year.

CLIMAX RUBBER TO BUILD

COLUMBUS, OHIO, April 12—The Climax Rubber Co. will soon start the erection of a large tire and tube plant on West Goodale Street, on a tract of 20 acres recently purchased. Plans for

the structure which will be about 200 feet square and three stories high, are being prepared by Architect N. F. Blair of Cleveland. Equipment will be installed providing for a capacity of 2500 tubes and 1000 tires as the first unit. It is expected to have the plant ready for operation by October 1. Irving S. Hoffmann is president; H. A. Longshore, vice-president; M. E. Swanson, secretary-treasurer; C. B. Turner, assistant secretary-treasurer, and R. S. Fletcher, sales manager. The company has a plant in operation at Huntington, W. Va.

Tire Price Comparison

NEW YORK, April 12—Comparison of new prices on some of the leading tires in the 34 x 4 size, with the former scale on the same size, are shown in the following table:

Tire	N.S. Fabric		N.S. Cord	
	Old	New	Old	New
Ajax	32.20	33.95	52.30	61.00
Firestone	34.10	40.10	50.65	59.60
Fisk	32.70	40.00	49.45	59.45
Goodrich	31.85	39.60	49.50	59.25
Goodyear	34.10	40.10	50.65	59.60
Kelly-Springfield ..	44.85	52.75	59.60	68.50
Lee	33.20	40.10	50.65	59.60
Mason	39.70	43.65	53.35	60.00
Mohawk	42.40	49.90	61.55	70.35
McGraw	37.35	44.10	50.65	65.65
United States..	37.15	43.30	49.70	59.80

Bosch Production Increases 440 Per Cent

SPRINGFIELD, MASS., April 12—An increase of 440 per cent in production for March over the same month in 1918 is announced by the American Bosch Magneto Corp. The total last month was nearly 440,000 and the company's ambition is to make this year fully half the magnetos used in the world. The plant was taken over in 1918 by the alien property custodian, but the new owners did not gain possession of the property until a little more than a year ago.

HAYES COMBATS LIVING COSTS

JACKSON, MICH., April 10—Hayes Wheel Co. employees have opened a co-operative store to combat the high cost of living. The storekeeper, who is employed by the company, "tends store" at noon and after five o'clock in the afternoon and after ten o'clock on Saturdays. By an arrangement with wholesale dealers employees are enabled to save a material amount on their foodstuffs.

SMITHS' COMPANY NEW

SPRINGFIELD, MASS., April 12.—The Smith Springfield Body Corp. is rapidly preparing to get into construction. Hinsdale Smith, president of the new company, and his brother Arthur, who is treasurer, have brought to the business the knowledge of body building which made the famous "Springfield Tops" such a success, but their company has no connection whatever with the original Springfield Metal Body Co. and the capital behind it is entirely new.

Flood of War Planes Feared by Makers

Anti-dumping Legislation Will Be Sought to Protect Industry

NEW YORK, April 12—Belief among American aircraft manufacturers that foreign makers are preparing to flood the United States with discarded machines of military types, has been strengthened by the announcement that Handley Page has purchased \$50,000,000 worth of planes and equipment from the British government. Similar plans are believed to be in the making by Sopwith and Avro interests.

The exact purpose of Handley Page's visit to this country has not been disclosed, although it was ostensibly to investigate the feasibility of establishing commercial aerial routes. It is believed, however, that he also made extended inquiries concerning the possibility of finding a large market here for second-hand British planes.

Caproni, the famous Italian aircraft maker, now is in this country and has not announced his precise plans, but so far as can be learned he is considering the advisability of establishing an American plant for the manufacture of his planes for commercial purposes. He would use American labor to a large extent and American makers do not object to foreign competition along commercial lines.

Representatives of Farman, also, are in this country, and they are supposed to be seeking a market for surplus French military machines. German makers have their eyes on America, too.

The contention of American manufacturers is that the widespread and indiscriminate sale of foreign machines designed for military purposes would give a black eye to aviation in this country. They point out that there would be no foreign mechanics here to overhaul them in case of accident and that Americans would not be familiar with their structure. Nor would there be available a supply of spare parts. The result would be, it is asserted, that if a man bought one of these planes and had trouble with it he would become so disgusted he never would want to see another air vehicle.

Would Glut Markets for Years

Another argument brought forward against foreign planes of military make is that their introduction here on a wholesale scale would supply the demand for a long time to come to the disadvantage of American manufacturers.

Congress is not blind to the menace of the situation and it is expected anti-dumping legislation will be enacted which would attach a prohibitive tariff to the importation of discarded military airplanes. Nothing would be done, however, to discourage foreign manufacturers from trying to find a market here for commercial machines of the newer types.

METAL MARKETS

AUTOMOTIVE INDUSTRIES
begins to-day the publication of a weekly review of the situation in the metal markets which is designed to be authoritative and forward-looking rather than a résumé of what already has happened.

Pig Iron.—Before the railroad strike put a crimp into activity, the market had displayed unmistakable signs of the formation of a fresh buying movement. Middle West advices disclose a good demand in the automotive industries.

Iron and Steel.—The premium market for automobile sheets was on the point of vanishing when interruption in rail transportation again stressed the paucity of the reserves of certain consumers. For the time being, warehouse steel of all kinds is eagerly sought after, regardless of the expense entailed in securing immediate delivery. In the aggregate, however, this business is of retail proportions. Several large automotive interests are reported to be negotiating for good-sized tonnages of alloy steels for third quarter 1920 deliveries. Sheet bars are nominally quotable at \$70 to \$80.

Aluminum.—Thanks to the steadily expanding use of this metal in the automotive industries, both in rolled form for bodies and in castings, the transition of the aluminum industry from a war to a peace basis has been accomplished in such a way that the probabilities are for a record-beating consumption in 1920. When the Government ceased buying for war purposes, the sole producer was apprehensive lest the task of educating the public to the use of aluminum would have to be started anew. The astounding increase in the aluminum takings of the automotive industries, estimated to be now at the rate of more than 100,000,000 lb. a year, solved the producer's problem. The market is firm at 33c. for virgin ingots, 98 to 99 per cent pure.

Copper.—The boom which had its inception in a widely advertised report that a banking syndicate would finance exports was apparently shortlived. Producers ask up 19½c., but resellers offer electrolytic at as low as 18½c. Casting copper is obtainable at 18½c.

Tin.—The market is easier, with Straits quoted at 63½c. to 63½c. Tin is cheaper in London than at Singapore, the English market basis being around 60c.

Lead.—Consumption is on the decline and the market is easy at around 9½c. to 9¼c., New York. As result of the railroad strike premium on spot is offered.

Zinc.—Uncertainty of deliveries caused a halt in buying. Prime Western is easy at 8½c. to 8½c., East St. Louis.

Antimony.—Quiet at 10½c. to 10½c. for ordinary, duty paid. Best Chinese quoted at 11c.

Brass.—Mills are unwilling to book orders for rolled brass far ahead. Labor troubles in the Waterbury district are responsible for this. One consumer bought yellow metal sheeting at 26¼c.

Mitchell Earnings \$1,108,618

Report for 1919 Shows

RACINE, WIS., April 10.—The annual report of the Mitchell Motors Co., the first to be made public in two years and the first since Mitchell activities have come under the management of President D. C. Durland, gives net profits equal to \$8.86 per share before Federal taxes have been allowed for and \$6.50 per share after liberal appropriations for taxes have been made.

The statement is a conservative one—in fact the reorganization policy of the company under Durland has been one pointing to substantial manufacturing policies. While redesigning the car, reorganizing the factory and largely changing the organization personnel, the management has written off \$1,700,000 in depreciations and has fitted new machinery valued at \$850,000. There are no bonds, no preferred stock or other funded debt against the company. The 125,000 shares of common stock of no par value are closely held and there is little activity among its shares on the stock exchanges. In the annual statement as of Dec. 31, 1919, the inventory includes only materials for 1920 cars carried at full cost value.

Mitchell is now building all of its own open and closed bodies, this being the first year it has built its closed types, such as sedans and coupes. The policy of making nearly all car parts, including forgings, has been persistently developed during the past year. The company has 3000 employees and built 1300 cars in March.

The annual statement shows the total liquid assets of \$5,219,890.77 to be approximately 1½ times the current liabilities of \$3,364,175.67, which as a strong ratio for a concern of Mitchell's size. The assets do not include any items on patents or goodwill. The item of \$38,137.03 in the assets has been paid by the United States Government since the statement was made and was in war work.

Since completing its war contracts of F. W. D. trucks a complete rearrangement of the factory has been carried out under R. C. Rueshaw, as a layout designed for production has been evolved. This has involved moving complete departments and arranging them in new sequence. Every foot of factory space has been utilized.

BALANCE SHEET MITCHELL MOTORS COMPANY, INC.

December 31, 1919.

ASSETS			
Current			
Cash			
In banks and on hand.....		\$528,297.70	
Due from U. S. Government			
On truck contracts.....		381,137.03	
Notes and Accounts Receivable.....	\$165,276.88		
Less reserve for doubtful accounts and notes.....	31,500.00	133,776.88	
Due from subsidiary company.....	151,187.56		
Less reserve to reduce to cost.....	46,887.60	104,299.96	
Inventories			
Raw materials, parts in process, finished cars, repair parts, etc.....	4,222,379.20		
Less reserve for possible losses.....	150,000.00	4,072,379.20	\$5,219,890.77
Investments			
Stocks in other companies, including New York Mitchell Motor Co.....		6,500.00	
Mitchell Motors Co., Inc., Stock purchased for employees, at cost.....		17,374.24	23,874.24
Permanent			
Real estate.....		445,951.51	
Buildings, machinery and equipment tools, patterns, furniture and fixtures.....	3,886,884.72		
Less reserve for depreciation.....	984,232.43	2,902,652.29	3,348,603.80
Other			
Sundry accounts and claims.....			24,282.65
Deferred			
Charge to future operations.....			51,143.15
			<u>\$8,667,794.61</u>
LIABILITIES			
Current			
Notes payable		\$2,390,000.00	
Accounts payable		665,602.56	
Dealers deposits		25,100.00	
Accrued			
Payrolls, insurance, U. S. Government Excise tax, real estate and personal property tax, etc.....		283,473.11	3,364,175.67
Reserve			
For Federal and State taxes estimated.....			300,000.00
For contingencies.....			90,000.00
Deferred			
Balance on materials used on U. S. Government contract, subject to possible claim.....			37,909.64
Capital stock			
Common—125,000 shares, no par value.....			625,000.00
Surplus			
Balance—January 1, 1919.....		3,442,090.59	
Earnings—Year ending December, 31, 1919.....	\$1,108,618.71		
Less reserve for Federal and State taxes....	300,000.00	808,618.71	4,250,709.30

Rail Strike Ties Up Detroit Factories

**Resort to Gasoline for Fuel
Futile with Finished Cars
Unshippable**

DETROIT, April 14—Two days' operation with all power from the Detroit Edison Co., shut off as a result of the outlaw railroad strike, finds all automotive factories crippled, and some of them closed down entirely. Only the office force is at work at the Hudson-Essex plant, where 7500 men are employed normally.

Hupp is closed down completely; about 50 per cent are off at the Dodge plant, 35 per cent are out at Ford's, and all of the other plants are running with make-shift power plants, with from 15 to 50 per cent of their employees at work. In all between 160,000 and 200,000 employees in the automotive industry in Detroit and Michigan are out.

Willys-Overland production at Toledo will close down to-night. Knights will continue to be manufactured with emergency power plants, but no attempt will be made to operate in the Overland factory.

Packard is operating its full force, generating its own power, but how long the supply of gasoline will hold out is problematical. Maxwell-Chalmers is practically closed. In many of the other power plants power is being generated with gasoline engines, but, aside from Packard, the effort does not appear to be meeting with great success from a production standpoint.

The Ford Motor Co. main factory is operated by its own power, but the blast furnaces and body plant are dependent on the Edison company.

BIG FACTORY EXPANSION

AKRON, OHIO, April 10—Miller Tire & Rubber Co. has secured building permits aggregating \$861,000 for factory expansions. The permits provide for three buildings, which will be constructed in response to the increased demand for products of the Miller factory.

METRIC SYSTEM OPPOSED

NEW YORK, April 12—Unanimous opposition to proposed legislation which would make the metric system obligatory has been voiced by the members of the National Automobile Chamber of Commerce. The organization will lend its support to the American Institute of Weights and Measures, which is combating the metric system propaganda.

CENTRAL TOP INCORPORATES

INDIANAPOLIS, April 12—The Central Auto Top Co., a partnership since 1912, has incorporated, with a capital of \$75,000. It will enlarge its capacity and add leather products to its manufacturing line. The officers of the new company are: President, William Swoboda;



Navy Aero-hydro Scout Airplane

The plane is equipped with air bags which when inflated make it possible to alight on the water. One of the planes thus equipped during maneuvers at Guantanamo Bay was temporarily lost for forty-eight hours

vice-president, Chester A. Carlisle; secretary, Charles Swoboda; treasurer, William Marble. The new line of the company will be under the personal supervision of Charles Swoboda, who was for 29 years superintendent of the Hide, Leather & Belting Co. of Indianapolis. The other three officers are the original partners who started in business in a barn in 1912 and built the business to its present proportions.

Bendix New President of Parrett Tractor

CHICAGO, April 12—Vincent Bendix has been elected president of the Parrett Tractor Co. to succeed Dent Parrett, who retired to devote all his time to the recently organized Parrett Motors Corp., of which he is president. The Motors corporation will manufacture a truck designed especially for farm uses, and a motor cultivator. George A. Gibson is vice-president and general manager of the tractor company; Robert Barbour, vice-president and chairman of the board, and Russell A. Reed, vice-president and director of export sales.

Bendix is the inventor of the Bendix drive and is a director of several manufacturing companies. Gibson formerly was president of the Chicago Motor Truck Co. Barbour is general manager of the Barbour Flax Spinning Co. of Paterson, N. J. Reed, who formerly was with the Oliver Chilled Plow Works at South Bend, is now at the head of Russell A. Reed, Inc., of New York, exporters of agricultural implements.

Tractor sales will be in charge of E. F. Sanders, with the company for some time, while motor truck sales will be handled by Herbert Scharlach, until recently in charge of the western territory for the Republic Motor Truck Co. of Alma, Mich.

Willys-Overland Earnings \$6,808,737

**Pays Preferred Stock Dividends
of \$1,735,268 — Common
Stock Disbursements Lower**

NEW YORK, April 12—In presenting his annual report to the stockholders of the Willys-Overland Co., the statement is made by President J. N. Willys that there is a famine demand for cars in all parts of the world.

The company in the year ended December 31, 1919, returned net earnings, after repairs, maintenance, expenses, but before deducting expenses of developing and perfecting new models, of \$6,808,737. Interest charges aggregated \$1,471,671 and reserve for renewals and depreciation, \$1,894,687. After \$1,707,111 had been deducted for replacements, balance available for preferred dividends was \$1,735,268. Holders of the preferred stock shared \$1,632,732 in dividends, after which a \$102,536 balance remained for common dividends. This amount fell short of the 1919 common disbursements by \$1,527,321.

"Present conditions are highly satisfactory," said Willys's statement, "as production has reached 650 cars daily, and, in the near future, a daily schedule of 750 cars will be met and consistently increased as material conditions will permit. The first quarter of the year will show approximately 40,000 cars turned out, which is not quite 50 per cent of the total production in the year 1919, so that for the full year 1920 there is every reason to expect a final production in excess of 180,000 cars—the manufacturing goal for 1920 being 200,000 cars. Estimated sales for the year should be more than double those of 1919, which were \$87,500,000."

March Production of 176,831 Establishes New Detroit Record

Labor Turnover and Railroad Tie-ups Fail to Slow Industry— April Outlook Not Promising Unless Relief Comes to Speed Deliveries of Material and Fuel

DETROIT, April 9—Spurred by the insistent demand for automobiles, manufacturers in the Detroit district, despite freight congestion, labor shortage, lack of parts and innumerable interruptions, broke all records for production in March with a total of 176,831 cars. The situation with the truck makers was on a par, and unless the railway strike, which resulted in a practically complete tie-up in the railway yards to-day forces a suspension of manufacturing, the record established in March will be greatly exceeded this month.

Production figures for March, although less than those announced for January, are actual figures, where as in January figures in some instances were schedules outlined rather than actual production. The total for January also included Ford trucks, which amounted to approximately 12,000.

A majority of the manufacturers fixed 20 per cent as the March increase over any other month in their history. This, too, in face of the fact that the production was 30 per cent under the output scheduled for March in most factories.

The shortage of freight equipment, which has necessitated drive-aways of a large part of the output, continues and unless the strike situation is cleared up speedily dealers will be forced to resort to the overland method for practically the entire output. At the same time the manufacturer is in about the same predicament as the dealer, for his trouble lies in getting his parts to the factory, and is almost as serious a problem as that of getting the finished cars away.

Trucks Rush Delayed Material

Material is being brought into the city from distant points by truck trains, and the output of cars is increasing daily in response to the extraordinary demand. What was believed to be the high water mark set last year is being surpassed, capacity increase and labor increase have been forced, and every department has been stimulated to utmost energies in the effort to supply the demand.

The labor situation as it is affected by common labor is bad. The high price demanded by common laborers is working a hardship on manufacturers, not from a financial standpoint, but in productive efforts. This is aggravated by the daily payment system inaugurated by independent contractors and by some manufacturers. A large proportion of the laborers who get 70 and 75 cents an hour and receive their pay when they leave at night work only a few days in succession.

In the majority of factories labor is paid semi-monthly. If a man quits he

cannot get his money until pay day, and quite naturally he realizes the folly of lying around idle three or four days while awaiting pay day. The result is that the factory gets at least the full two weeks' time. A movement is on foot looking to an agreement that will put an end to the daily pay system, which employment managers insist is the cause of most of their production problems.

The housing situation, which affects to a greater extent the skilled mechanic and the better class of labor, still is acute. Civic officials and private citizens, however, are making strenuous efforts to overcome conditions, and buildings now are springing up all over the city and beyond the limits in the effort to care for the homeless now in Detroit, and thousands of others for whom employment is waiting.

Leads in Home Construction

Building Commissioner J. C. McCabe announced to-day that more than \$22,000,000 had been spent on new home construction during the first quarter of 1920, and Detroit to-day leads all cities in the nation in the number of houses under construction.

Some idea of the labor problem is furnished by McCabe, who in describing difficulties encountered by contractors, declared men are working less than formerly despite the increased wages, and their productive effort is 25 per cent under that of the period prior to the war, when wages were less than half as much as they are to-day.

Recent cancellation by General Motors of vast expansion plans in Detroit and vicinity is said to have been caused by the feeling that the company was working against itself in paying the high prices demanded, and using up such a vast amount of available labor. Not only was the company competing against itself in the labor market, but the effort to rush the immense development was construed as creating impossible conditions for every one else, compelling a general increase in labor cost with no betterment in the labor supply.

With all these conditions facing the industry the record for March stands out pre-eminent. At the beginning of the year, when manufacturers announced schedules that in the aggregate totaled between 2¼ and 2½ million cars, they withheld about 20 per cent of the desired or proposed schedule. While figures for March are close to the announced schedule they are far behind the output that really was hoped for.

Packard sounded the most optimistic note. The company was able to get many more freight cars than conditions

had led officials to believe possible. The company was well supplied with steel and was able to get parts in goodly amounts and sufficient to care for the month's production.

The Ford plant had an extraordinary month, turning out 80,008 passenger cars and 14,291 trucks, a total of 94,299.

At the Overland plant a schedule of 600 cars a day was maintained for the 27 working days in the month. Overland was handicapped, like all others, in the matter of freight cars in and out of the factory. The labor situation at the Overland plant eased up considerably, however, and officials declared the extra effort put forth by factory executives stimulated employees in all departments and increased the productive effort materially. Overland plans to reach a maximum of 800 cars a day in the near future, probably by June 1.

Report 20 Per Cent Gains

At the Hudson plant it was said production in March was 20 per cent in excess of any month in its history. The same situation prevailed at Cadillac, Dodge, Paige, Columbia, Hupp, Liberty, Maxwell and in a majority of the plants outside of Detroit. Factories out in the State in fact were better off than those in Detroit insofar as parts and material supply was concerned. They were handicapped greatly by the lack of freight cars to move the finished product and were compelled to drive away most of their cars and store the remainder of the others.

Jackson Motors Corp. was able to secure but one freight car a day on an average, and was compelled to utilize space in the State fair grounds for storage. Incoming freight conditions, however, were better than during the previous month, and the company was not handicapped by lack of parts.

Briscoe has had no freight cars for several weeks, but has been getting parts in good quantity. Briscoe officials said while March was extraordinary from the production standpoint, it could hardly be said to be the greatest in the company's history. Plans for April, officials said, contemplate a great increase over that of March, unless the present freight strike forces a tie-up.

Further Increases Sought

At the Packard plant 815 cars and an equal number of trucks were built during March, and the plans for April call for a 25 per cent increase. The Studebaker plant in Detroit, while exceeding all previous schedules, was just up to 5,000, the number outlined as the probable production. Studebaker experienced a tightness in the matter of parts, but was able to make the schedule and will greatly exceed the March production during the present month. Saxon Motor Car Co. is not yet in production of finished cars, but is sending stripped chassis to all distributors for display purposes.

With the new cars soon to be in production in Detroit, and manufacturers of all cars aroused to keenest effort by the insistent demands, the scheduled output probably will exceed the announced total.

Preferred Motors to Build in Louisville

Company Representatives Seek Factory Site—Plan 10,000 Production in Three Years

LOUISVILLE, April 12—Louisville is to be the home of the Preferred Motor Car Co., capitalized at \$2,000,000, which proposes, in three years after establishing a factory here, to turn out 10,000 cars a year.

Representatives of the concern, with temporary offices at Indianapolis, have been here for some time looking for a suitable factory site and conferring with officials of the Louisville Industrial Foundation.

The concern, according to its president, F. W. Young, will employ about 1000 men, and will bring to Louisville 400 skilled workmen. It proposes to turn out 3000 cars during its first year of operation.

The company, Young said yesterday, will build its cars, passenger and truck, on the interchangeable parts system. They will range in power from 25 to 40 horsepower, and will be put on the market at from \$1,200 to \$1,400 each. It is proposed to dispose of \$1,000,000 of stock to Kentucky people.

AUSTIN OUTLINES OUTPUT

LONDON, March 29 (*Special Correspondence*)—The interest taken in the British Austin Motor Company and its prospects of making good, having regard to its large capital and vast acreage of buildings are shadowed by the following reference at the annual meeting, at which the chairman stated that the schedule of production for this year, called for by orders actually in hand, requires a weekly output of 200 Austin "Twenty" cars; 100 Austin farm tractors; 60 1½-ton lorries, and 500 electric lighting sets. Besides these, a large number of switchboards and other electrical equipments, and at least 25 complete airplanes will be made weekly. Austin cars are beginning to be seen about, which is sufficient evidence of production having been considerably increased. ENGLISHMAN.

(Continued from preceding page)

New Cars Are Held Over

Lincoln Motor Co., which was expected to be in production in April, has experienced delays and handicaps that make the date of delivery of Lincoln cars problematical. Wills-Lee also has been delayed, and the new car, which rumor says will be an eight, is expected to be in production some time in June.

Friend Motors Corp., which took over the old Olympian, has changed the specifications in many respects, and is building cars.

No cars were built by the Harroun Motors Corp., the Handley-Knight Co. at Kalamazoo, or the Jacquet at Belding. Handley building construction is being

rushed as rapidly as possible, and the plant will be in production within 90 days. Jacquet building construction is completed, and the company is held back only by lack of one or two parts. While the future cannot be foretold, Jacquet officials hope to be in production by May 1. They will build nothing at the present but a roadster and sport roadster. Harroun Motors still is undergoing re-financing plans and no date has been fixed for a start on actual production.

Craig-Hunt to Make New Low Priced Car

INDIANAPOLIS, April 12—The Craig-Hunt Motors Company has incorporated for \$1,000,000 to manufacture a small, low-priced passenger car. The following officers have been elected: J. R. Craig, president; W. L. Hunt, vice-president; C. L. Zechiel, secretary and treasurer.

The Craig-Hunt Motors Company has absorbed Craig-Hunt, Inc., which has for the past five years been manufacturing Ford speed specialties. The new company will manufacture two different style passenger cars—a 5-passenger touring car and a 2-passenger roadster. The present company will continue to make and market Ford speed specialties.

The executive offices of the Craig-Hunt Motors Company will be in the Claypool Hotel until their new administration building is completed.

BRITISH SELL ARMY TRUCKS

LONDON, March 29 (*Special Correspondence*)—It is officially stated that 17,646 trucks and truck chassis, the property of the British Government, have been disposed of for \$35,500,000; 8843 cars and light trucks (ambulances) have been sold for nearly \$6,000,000, and 15,058 motorcycles for over \$300,000. These rates are at the pre-war conversion of the pound sterling.

There remains an immense number of trucks to be disposed of; large numbers of them being parked at the Government re-conditioning works at Slough, near London.

PROPOSE AERIAL POLICE

CINCINNATI, April 10—Details of a proposed system of aerial police to protect the entire state of Ohio will be presented to the convention of the associated aviation clubs of Ohio to be held at Columbus, May 6, 7 and 8. The air force would provide protection for concerns having long and complicated lines of transportation or communication.

FISK ENTERTAINS ENGINEERS

SPRINGFIELD, MASS., April 10—The Engineering Society of Western Massachusetts, with more than 125 members present, was entertained at the plant of the Fisk Rubber Co., last week, in connection with a regular meeting of the organization. The afternoon was passed in inspection of the plant. Dinner was served in the Administration building, followed by a brief business meeting.

Industry Kept Going by Big Truck Fleets

Chicago Falls Back on Motor Vehicles When Strike Ties Up Railroads

CHICAGO, April 12—Once more the motor truck has been called upon to keep Chicago's business running. Without the truck the strike of railroad switchmen probably would have completely paralyzed some of Chicago's most important businesses. As it was, however, the trucks performed such valiant services that the man on the street scarcely was aware that the city faced one of its most serious transportation crises.

The meat packing industry is vitally dependent upon continuous freight service, but the packers called upon the motor trucks and saved the situation. Big fleets of trucks employed by the great packing firms were called upon to take up the tremendous task of supplying branch houses and car route stations within the Chicago zone.

Within a few hours after it was definitely known that the wheels of refrigerator cars could not be turned, new motor truck routes were laid out to cover a zone stretching fifty miles in every direction from Packingtown. Every available truck was requisitioned for this long distance service while city transportation was turned over largely to lighter vehicles.

On the second day of the shutdown, motor trucks of Swift & Co., carried fresh meat and prepared food products to the extent of 400,000 pounds in excess of their normal truckage. In addition to the regular fleet, ranging in capacity from 3½ to 7 tons, a number of vehicles were engaged from outside sources in order to meet the heavy demands of the Chicago territory.

Similarly, other big industries in Chicago were forced to turn to the truck to keep their wheels moving. In many instances it was found freight consigned to Chicago had got as far as cities from 50 to 100 miles away where the cars were held up. Business houses were kept busy tracing these loads and once located trucks were dispatched to the cities, the cars unloaded and the freight brought into Chicago by truck. Almost every sort of commodity was handled in this way with the result that Chicago's business was saved from a complete paralysis.

WOULD OPEN CANADIAN TRACT

WINNIPEG, MAN., April 10—Approximately 5,000,000 acres of land would be opened up by the construction of a great highway which it is proposed to build from the Great Lakes in Ontario to this city. The Manitoba government is prepared to complete a portion of the road if the Ontario government will co-operate as it has been urged to do by the business interests of central Canada.

Mergers Strengthen British Companies

Production of New Models by Combined Firms Slowly Getting Under Way

LONDON, March 29 (*Special Correspondence*).—As the motor industry tends to settle down to normal conditions, it is becoming apparent that there is no business future for a number of companies, though some of them are responsible for designs of intrinsic interest, and the stability of others is likely to be attained only by fusion.

The Cosmos Co. of Bristol is one instance in the first score. This company, after a fairly successful war experience, during which they brought out some high grade radial engines, notably the "Juno" and "Jupiter" models, introduced at Olympia a three cylinder air-cooled car styled the C. A. R., which received much attention because of its somewhat novel layout and the comparatively low price at which it was listed.

Formerly the Cosmos interests were allied with the Straker-Squire Co., of London, but the latter company went out on its own, and is concentrating on a "six" car and a much better known, because longer established, line of trucks. This latter company bought a Government factory at Edmonton, London, for about \$500,000. The Cosmos Engineering Co. continued as a separate venture in the old, but much enlarged works at Fishponds. It is reported that Roy Fedden, engineer and designer of the C. A. R., and designer of the pre-war Straker-Squire 15" four cylinder car, which the new Straker-Squire "six" has superseded, is interested toward acquiring the Cosmos interests.

The recent fusions referred to are the absorption of the Hillman Car Co., by the Triumph Cycle Co., Ltd., both of Coventry. The Hillman Car has been on the market for some years, and may now be developed for an output comparing with its merits. Another fusion and absorption is that of the Albert car interests by Gwynnes, Ltd. of Hammer-smith and Chiswick. The Albert is a new "four," the first post-war product of a designer named Lord, associated with Adam Grimaldi & Co., aircraft builders during the war.

Gwynnes' Seek New Capital

Gwynnes' are now out for more capital (debenture stock), apparently on the strength of this fusion, the sum asked for being \$1,500,000. This company is old established as makers of steam pumps and considerably benefitted by the war, during which the factory at Chiswick was busy with Clerget aircraft engines. A first year's output of 5,000 Albert cars is scheduled for, and it is stated that 3,000 were ordered at the Olympia show. The works engineer is W. Channell, formerly with the Lanchester Company of Birmingham, and is said to have a 15 years experience of mass production in the United States.

The chairman or president of Gwynnes is also a director of the Napier company. Messrs. Grimaldi and Lord, of Adam Grimaldi & Co., having severed connection with the Albert car, are preparing to build a "six."

The Ensign "six," another post-war British car which made its debut at Olympia, is to be built by the Crabtree Co., a large engineering firm in Yorkshire, with branches in London. The pioneer specimen of the Ensign chassis was remarkable for its robust appearance, suggesting more weight and "trimmings" than are liked now-a-days.

The Harper-Bean Co. has taken over the output of the A. B. C. Motors, Ltd., another new (post-war) product which was exhibited at the November Olympia show. The designer is Granville Bradshaw, who achieved some reputation in the war for aircraft motors. The A. B. C. has a two cylinder opposed, horizontal air-cooled engine, four speeds and reverse gear and spiral-bevel a.c. gear. Apparently the Harper-Bean group believe there is a future for this class of layout, which is curious considering its trend toward and increasing appreciation of "sixes" and more cylinders in Europe generally.

—ENGLISHMAN.

British Plan Special Car for South Africa

LONDON, March 29 (*Special Correspondence*).—A scheme is afoot for building in England a special Colonial model British car. The chief sponsor of the scheme is in London, and hopes to see it successfully through before he returns to South Africa, where he has a prosperous motor car and truck business. His firm handles American as well as British vehicles, and he has expressed satisfaction with the American wares, in fact, it seems that most of his present purpose is concerned with gingering up British makers by showing what their American competitors are doing.

The proposed car, it is understood, is to be build solely for the Colonial market, and, therefore, will not compete with any home product on the British market. As the scheme has not got beyond the quantities estimating stages, it will suffice to mention that estimates for its cost range from \$2,000 upwards. It may be expected to sell in South Africa at \$3,500 provided the factory cost does not exceed \$2,500.

—ENGLISHMAN.

MEXICAN GASOLINE RAILROAD

MONTEREY, MEXICO, April 12—An initial appropriation of 800,000 pesos, which is equivalent to \$400,000 American money, has just been made by the State of Nuevo Leon for the construction of a 70-mile gasoline motor railroad that is to run from Monterey through a rich agricultural and mining country extending to the east and south of here. It is stated that the total cost of the proposed railway will be approximately \$2,000,000. The survey has been made.

Murray Motors in Receiver's Hands

Only Assets of Company Are Plant Site and Building in Newark

NEWARK, April 12—The Murray Motor Car Co. has been forced into a receivership by the action of creditors. John W. McGeehin, an attorney, has been appointed receiver by Vice Chancellor Backes upon application of counsel for the Colyer Printing Co.

McGeehin said to-day his first move would be to place in the hands of real estate brokers the site on Frelinghuysen Avenue which the company had contracted to buy from the Samuel Jones Co. for \$50,000 and on which \$2,000 had been paid, and the building, which was to have cost \$100,000, on which the company had paid but \$5,000.

McGeehin said the Murray company, which was incorporated under the laws of Delaware only last fall, had had several sets of officers and he had not yet been able to determine who was who among them at the time he was appointed.

The question had been asked as to what will happen to the people who subscribe to stock and have not yet completed their payments.

"This is a matter I will have to study later," the receiver declared. "I will not take that up until I have made arrangements to dispose of the only assets I have been able to locate—the site and partly completed factory."

The company, as far as the receiver can learn, has not manufactured or assembled a car since it was incorporated.

The petition of the Colyer Printing Co. gives the Murray assets as \$93,000 and its liabilities as \$89,000, but included in the assets are a number of unpaid stock subscriptions.

A. J. Butler of Jersey City, who represents most of the stockholders, agreed to the receivership.

LONG BODY PLANT MAY MOVE

FRAMINGHAM, MASS., April 9—Efforts are being made to get R. H. Long to move his body making plant from this city to Worcester, where it is proposed to give him greater facilities for shipment and other things than he has at present here. While the matter is being considered nothing is being given out so that in case Long should decide to go he would not be held up by land profiteers. With enlarged facilities he could employ 4500 people, and in Worcester there would be enough interest to keep good men contented, while now they have to go to Boston, some 20 miles, when they want to have a holiday.

TO OPEN EUROPEAN OFFICES

NEW YORK, April 13—F. B. Caswell, sales manager of the Champion Spark Plug Co., Toledo, will sail for Europe April 20, to open branches of the company in London and Paris.

European Racers Prepared to Sail

Peugeot Racing Team Will Be First to Arrive—Fiat Speeds Models

PARIS, April 3 (*Special Correspondence*)—Jules Goux and André Boillot, European members of the Peugeot racing team, will sail from Havre on April 17, bringing their new mounts with them. The new 183 cu. in. Peugeots have already been on the road and have created a very good impression.

Jean Porporato and Jack E. Scales are shipping their two Porporato cars from Havre on April 24, and will sail from the same port on La France May 1. Porporato has already raced on all the American tracks, his best performance being at Chicago. Jack Scales is an Englishman who, until quite recently, was a member of the Fiat racing team. He was picked to drive a Fiat at Indianapolis in 1917, when the war caused this race to be called off. This is his first appearance in America.

The Porporato cars, which have been designed by one of the best specialist engineers in France, have been built privately in Paris. The few experts who have seen them pick them out as powerful contenders for the first prize.

In all probability the Ballot racing team will sail from France on May 1. The drivers picked are Jean Chassagne and René Thomas. The third driver is Ralph De Palma. It is quite possible that Ballot will enter either one or two small cars of only 122 cu. in. It is not expected that these will provide the winner, but Ballot is certain that they will make a sensational performance. The Ballot 183 cu. in. racers have eight cylinders in line; the baby Ballots have four cylinders.

News from Italy is to the effect that Fiat is working day and night on three racing cars. At the present moment it is not absolutely certain that these can be ready on time. Fiat has gotten out entirely new designs, with engines reputed to run at 5000 revolutions a minute. Louis Wagner, captain of the team, is on the spot, and if not able to ship his cars in time for the race, he undoubtedly will be the most disappointed man in Europe.

Practise Prohibition Diet

Competition among European racing drivers never was so keen as this year. André Boillot, who is the most daredevil driver France has ever produced, put himself into severe training three months ago and has sworn that he will bring the first prize back to Paris. René Thomas has not forgotten his defeat in the Targa Florio nor his ill-luck in the last Indianapolis race. Thomas is "the Silent Frenchman," but if anybody ever dares to doubt his ability to pull down the first prize he gets excited and loquacious. When America went dry Boillot and Thomas did likewise, so as not to feel the effects of a new régime

on reaching America. Although the greatest fight is expected between these two, there will be some hard driving from Goux, Chassagne, Porporato and Scales.

Among the Europeans who are expected to come for the race are M. Ballot and his racing engineer, Henry; Owen Clegg, chief engineer of the Darraq Co.; Louis Coatlen, of the Sunbeam Co.; Charles Faroux and W. F. Bradley.

Despujols Glide Boat Does 74½ Miles an Hour

PARIS, March 28 (*Special Correspondence*)—A speed of 74½ m.p.h. is claimed to have been attained on the half-mile basis by the Despujols gliding boat while practising on the Seine for the Monaco races. This boat, which is a stepped hydroplane, is fitted with a Sunbeam 12-cylinder 450 hp. airship engine, similar to those used aboard the transatlantic airship. The engine runs at 2100 r.p.m., but the screw is geared up to 3000 r.p.m. This is the first time a geared-up screw has been used, the long accepted theory being that cavitation set up at 1800 r.p.m.

This speed performance, if correct, would constitute a world's record. It has to be pointed out, however, that the timing was done by stop watches held by persons on the bank. Every year higher average speeds have been claimed for boats on the Seine than it was ever possible for the same craft to attain over the measured mile and kilometre in Monaco Bay. This can be attributed to inaccuracies in timing, to the help obtained from the current, and to the smoother water prevailing on the river. There is no doubt, however, that Despujols-Sunbeam is the fastest boat ever built in France.

Fidelity Tire to Bid On Camp Taylor Site

LOUISVILLE, April 12—D. Dierenburg, wealthy Chicago auto tire manufacturer, has been in Louisville during the past week looking over a site for an automobile factory. He was here for several days and inspected Camp Zachary Taylor. He imparted the news to a friend before returning to Chicago that he would bid on the salvage of the camp when the Government decided to dispose of it.

It is understood that Dierenburg's intention is to open an automobile factory in Louisville in the near future and that he is desirous of getting the camp site if he can buy the buildings reasonably and get satisfactory leases on the land. Dierenburg makes the Fidelity tire at Chicago.

SOUTHERN OFFICES MOVED

ITHACA, N. Y., April 12—The Morse Chain Co. has removed its southern headquarters from Greensboro, N. C., to the Commercial Bank Building in Charlotte, North Carolina.

Publishers to Act on Car Publicity

Manufacturers Will Ask That Restrictions Be Made on All Free Matter

NEW YORK, April 12—Whether or not New York newspapers shall place the most stringent restrictions on publicity will be determined by the final vote of the individual members of the Publishers' Association which will be taken soon. A committee which has been investigating the question has recommended that such a step be taken.

If the code proposed is adopted it would forbid the papers using the names of individual automobiles except during show week and in connection with races in which three or more cars are entered.

The National Automobile Chamber of Commerce has asked to be given a hearing on the question and the request has been granted. It will be pointed out that automobile advertising carried in New York papers amounts to approximately \$2,750,000 a year, which places the industry well to the front among groups of advertisers.

The position is taken that if newspapers will place the same restrictions upon publicity for real estate, theaters and baseball, no objections whatever would be interposed. It is argued, however, that automobiles play just as important a part in the life of the people of the country as theaters and that they are entitled to equally liberal treatment in the news columns.

It is not believed that the papers intend to eliminate from their columns any real news. They assert, in fact, that such is not their purpose. The publishers contend that their space is especially valuable just now because of the shortage of print paper and they intend to scan all publicity closely to see what has real news value. Having taken this position they say it is now up to publicity men to produce material which they cannot afford to throw away.

MAXWELL EARNINGS, \$2,992,000.

NEW YORK, April 12—President W. L. Mitchell, of the Maxwell Motor Co., reports to the stockholders that on a production of 49,746 cars and trucks in the eight months ended March 31 last, earnings were returned of \$2,992,000. He says demand is far in excess of production and that the fiscal year which ends July 31 should show gratifying results.

BETHLEHEM DESIGNS NEW CAR

NEW YORK, April 14—The Bethlehem Motor Truck Corp. will bring out a passenger car, for export only. The car, which will have a Bethlehem engine and Timken axles, will be of the 4-passenger sport type popular abroad, and will sell for about \$3,000. It is expected that production will be under way shortly at the factory in Allentown, Pa.

Automotive Financial Notes

Hayes Wheel Co.—Announces it has completed plans to double this year its output for 1919 when 956,991 sets of wheels were shipped. Net sales for all plants in 1919 amounted to \$14,686,383, while goal set for this year is \$30,000,000.

Block Tire & Rubber Co.—Capitalists from Terre Haute, Ind., became interested in company and will increase capitalization to \$1,500,000. New plant proposed to supplant small one at Lafayette, Ind.

Dayton Rubber Mfg. Co.—Increases capital to \$10,000,000. Part of proceeds will be used to enlarge present plant.

Lincoln Motor Co.—Declares initial quarterly dividend of \$1.25 a share on Class A stock.

Overman Cushion Tire Co.—Stockholders meet April 15 to increase stock from \$250,000 to \$550,000.

Peerless Truck & Motor Corp.—Annual report shows net sales of \$12,928,601 with net income of \$806,648, and a surplus for the year of \$670,628, making a total surplus of \$5,259,600.

Quality Tire & Rubber Co., Anderson, Ind.—Arranges to consolidate with Long Wear Tire & Rubber Co., Elyria, Ohio, under latter name. New corporation will have capital of \$5,000,000.

Timken-Detroit Axle Co.—Has appropriated several million dollars for additional buildings and equipment to increase output 50 per cent in 1921. Financial statement discloses surplus of \$10,175,579 at close of 1919.

Binghamton Electric Truck Co., Binghamton, N. Y.—Incorporated with \$200,000 capital.

Oshkosh Motor Truck Co.—Engages architects to design additional buildings to cost \$150,000.

Empire Motors, Ltd.—Incorporated at Toronto with \$250,000 capital to make automobiles, airplanes and motorcycles.

Gale Motors Corp.—Chartered at Indianapolis by Gard Gale and others to build automobiles.

International Motor Truck Co.—Declared stock dividend of 100 per cent on common. Reports production last year of 5015 trucks and production scheduled for this year of 9000. Announcement indicates new stock will be sold.

Standard Motor Construction Co.—Declared usual quarterly dividend of 2½ per cent.

Goodyear Textile Mills Co.—Los Angeles bankers underwrite \$2,000,000 of company's preferred stock. Proceeds, including proceeds from sale of \$1,000,000 common stock to Goodyear Tire & Rubber Co., will be used to erect plant and for working capital. Plant will have capacity of 33,000 spindles and output will be sold to Goodyear at 10 per cent profit.

Bowen Motor Railways Corp.—Organized at St. Louis to build gasoline propelled railway cars. A. D. Bowen is president. Proposes plant covering 20-acre site.

Kelly-Springfield Tire Co.—Declared regular quarterly dividend of \$1 a share and a quarterly dividend of 3 per cent in stock on common as well as 2 per cent on preferred.

McGraw Tire & Rubber Co.—Declared quarterly dividend of 1¼ per cent on preferred.

McCorf Mfg. Co., Inc.—Offers 25,000 shares of common stock at \$43 a share. Announces that it expects net earnings before Federal taxes to reach \$1,500,000 in 1920. Tangible assets applicable to common stock of consolidated companies amount to \$4,523,536.

Bruhn's Mfg. Co.—Incorporated at Hammond, Ind., at \$95,000, to manufacture a double eccentric jack. Plant soon will be in full production. Daniel Bruhn is president.

American Die Casting Co., Indianapolis.—Purchased for \$250,000 by T. A. Lavelle, T. J. Jones, and A. D. Hoover. Name changed to American Bearing and Die Casting Corp., and capital increased from \$100,000 to \$750,000.

California Aircraft Corp.—Organization announced by John Crick, San Francisco. Will build plant for construction of medium priced two seater airplane.

Premier Motor Corp.—Initial offering of company's stock announced. Capital authorized is \$2,000,000, half of which is outstanding.

Avalon Rubber Mfg. Co.—Capital increased from \$200,000 to \$1,000,000. J. F. Hower elected president and general manager.

Columbus Auto Parts Co.—Increases capital from \$150,000 to \$300,000, and will build new factory adjacent to present plant.

Mustor Mfg. Co.—Amalgamation of Triangle Packing & Rubber Co. and Mitchell-Barnes Mfg. Co., with headquarters at Grand Central Terminal, New York, will manufacture a line of packings and mechanical rubber goods.

Motor Products Corp., in a statement filed with the stock exchange, reports net profits of \$979,026.69 for 1919, before Federal taxes and Canadian business profits war tax. This is an increase of about \$300,000 over the previous year. Surplus is \$2,612,579.71, an increase of approximately \$1,000,000 over 1918.

Hayes Manufacturing Co., of Detroit, reporting to the stock exchange, shows net profits, after Federal taxes, of \$131,697.21 for 1919. Total assets were \$2,615,780.36, and surplus \$142,770.03. Current assets were \$1,313,140.07, and liabilities \$173,010.33. Property investment less depreciation was \$1,139,307.56.

Lincoln Motor Co. declared its first dividend on Class A stock this week, despite the fact that the company is not yet in production. The dividend was paid out of a surplus remaining from the production of Liberty engines.

U. S. Rubber Co. has declared a 2 per cent dividend on common and first preferred, both payable April 30 to holders April 15.

Ford Motor Co.—Will pay off \$7,500,000 of its outstanding 6 per cent notes on April 16. This maturity is part of underwriting of \$75,000,000 three months 6 per cent notes undertaken last fall by a syndicate of bankers headed by Chase Securities Corp. Only \$60,000,000 has been drawn thus far and \$17,500,000 of this amount already has been paid.

Mullins Body Corp.—Reports that for first quarter of 1920 it earned approximately \$250,000, and predicts that net profits after Federal taxes will amount to \$900,000 for the year.

Intercontinental Rubber Co.—Reports net profits of \$101,111, or 35 cents a share on its stock for year ended Dec. 31.

Bank Credits

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

Money rates are unchanged, except for stock exchange call money, which advanced to 10 per cent last Monday. The railroad strike has undoubtedly hampered liquidation through hindering the free movement of goods. April wheat crop figures, published during the last week, show prospects of the smallest winter wheat crop in a number of years.

Gold has reversed its movement during the last week and returned to the possession of the interior Federal Reserve banks at the expense of the New York Reserve Bank. The result was that, in spite of the importations of gold from England, the New York Bank showed a loss of nearly \$25,000,000 gold last Saturday, while the system as a whole gained \$7,200,000 gold. The New York condition was further reflected by a decline in the surplus reserve of the Clearing House banks.

Gold has once more begun to move to the Argentine, roughly \$10,000,000 having so far been engaged. Government deposits in Federal Reserve banks are still declining and on Friday last were at the lowest figure for the present movement—\$8,750,000.

WICO ELECTRIC TO BUILD

SPRINGFIELD, MASS., April 10—A modern factory, ultimately to consist of four units with accommodations for 1500 employees, is to be started this spring by the recently incorporated Wico Electric Mfg. Co., formerly the Witherbee Igniter Co. Architects are drawing plans for the first building of the four units, to cost between \$100,000 and \$150,000.

Minneapolis S. A. E. Discusses Tractors

Paper on Weight and Drawbar Pull Shows Trend Toward Higher Speeds

MINNEAPOLIS, April 10—At the monthly meeting of the Minneapolis Section this week a paper on Tractor Weight and Drawbar Pull was presented by A. F. Moyer of the Toro Motor Co. The paper dealt chiefly with the proper distribution of weight in a four-wheel tractor with rear wheel drive, in order to prevent loss of steering control and overturning.

Moyer said that the best weight for a tractor of given horsepower must be a compromise based on the many conditions to be encountered by a given machine or by different machines of the same model. While weight will logically bear some relation to drawbar pull, the latter in turn depends upon tractor speed. Having established total weight and speed, the next item for consideration is weight distribution.

Slow moving tractors will always involve heavier weight, both for the strength of parts and for obtaining the necessary traction to develop the larger drawbar pull. High speeds, on the other hand, permit light construction. Tractor implements will soon be adapted to higher speeds, so that the limitations of draft-horse speeds will no longer hamper the tractor as a branch of the automotive industry. Good plowing at 3 to 4 m.p.h. ought soon to become possible without sacrifice in efficiency.

Taking the speed at or near the highest at which good work can be done efficiently, the drawbar pull is readily determined from the drawbar horsepower, or vice versa. The ratio of drawbar pull to the total tractor weight is next for consideration. In a few exceptional cases this ratio has shown on test a value as high as 100 per cent, but will probably be nearer to 70 per cent for average conditions with rear drive wheel machines, depending on wheel equipment and weight distribution.

Having arrived at the desirable tractor weight, the designer must use his skill to keep within the desirable limit and at the same time to make the best disposition of the weight at his disposal. Drive-wheel efficiency will be increased by larger diameters, thus permitting the use of a smaller motor for the same drawbar horsepower delivered. The elimination of excess weight also reduces the necessary motor power by reducing the wheel rolling losses.

In his analysis of tractor stability, Moyer distinguished between four cases—drawing a load on hard level ground, on soft level ground and on soft inclined ground, and the tractor with its rear wheels sunk deeply into the ground and obstructed as by a log or rock in front of the driving wheels. In the first three cases moments were taken around the point of ground contact of the driving wheels and expressions developed for the condition of stability.

Moyer introduced the buoyancy of the loose soil in front of the rear wheel as a factor affecting the stability.

Discussion was offered showing that when the drawbar height above the ground is not considered, but instead the torque on the final drive gears is taken and the product of the drawbar pull into the distance of the drawbar below the rear axle deducted from this torque, the result divided by the wheel-base gives a weight lifted from the front wheels which seems to agree closely with experiment, whereas the analysis shown in one of the author's figures gave results entirely at variance with test data.

Men of the Industry

Howard L. Spohn, formerly of Motor Age, Motor World, Automotive Industries and Commercial Vehicle, and Frank A. Kapp, formerly of Motor Life, the Automobile Trade Directory and the Automobile Blue Book, have become associated with the Charles H. Fuller Co., advertising agent of Chicago.

William V. Lowe, formerly sales engineer with Hess Bright Co., and recently with Manning, Maxwell & Moore, Inc., has been appointed sales engineer of the Easton Machine Co., South Easton, Mass.

Hugo Gibson, until recently with the Vacuum Oil Co., is now with the Root & VanDervoort Engineering Co., Moline.

Nelson B. Nelson has resigned as assistant engineer of the J. I. Case Threshing Machine Co., Racine, to become associated with the Kardell Tractor & Truck Co. of St. Louis as superintendent and chief engineer.

J. C. Blair has been appointed manager of the Toronto office of Alfred Herbert, Ltd. He will be assisted by G. A. Keith.

H. A. Goddard, director of sales of the Sinclair Motors Corp., has been elected vice-president in charge of sales and a member of the board of directors.

William B. Walker, Jr., has assumed the duties of purchasing agent of the Dupont Motors, Inc.

Daniel O. Skinner, formerly advertising manager of the International Motor Co., has joined the Buffalo division of the Manternach Co.

Russell P. Askue has resigned from the publicity department of the National Lamp Works to enter a Cleveland agency.

Howard Wilcox, racing expert, has been appointed research engineer of the Cole company.

Charles H. Tavenor has resigned from the Curtiss Aeroplane & Motor Corp., to open a consulting engineering business in Garden City, L. I.

Joseph A. Mackle will soon take over the Jordan distributorship in Great Britain and Ireland.

George C. Rea has become the representative of C. E. Johansson, Inc., in the Chicago territory.

Ryan Resigns Seat On Stock Exchange Charges Discrimination by Committee in Proceedings Arising from Stutz Corner

NEW YORK, April 14—Allan A. Ryan made public to-day a letter sent to the Governing Committee of the New York Stock Exchange, announcing that, as a result of the proceedings taken in connection with the corner in Stutz stock, he could no longer continue a member and retain his self-respect. He asked that his seat be sold as soon as possible.

In his letter Ryan charged that members of the Governing Committee were partners in houses which, either for themselves or their customers, were short of Stutz stock and hence were sitting as judge and jury in a case in which they were financially interested.

The Protective Committee appointed to handle the interests of the shorts announced that Charles E. Hughes had been retained as advisory counsel.

In an earlier statement Ryan asserted that the corner in Stutz Motor stock was not of his seeking but was forced on him by the efforts of "sinister" influences to hammer down the price. He reiterated his offer of settlement made several days ago and added that while he was not seeking litigation he was ready to place the whole affair in the hands of the courts. In his statement Ryan said:

"The Stutz situation was not designed nor created by me. It was the result of persistent attacks on the stock by persons having absolutely no interest in the Stutz company, who were determined to profit by hammering down the Stutz stock and deliberately promoting a campaign for selling that which they did not own. They hoped to force down the price so as to buy the stock at ridiculous figures, in order thereby to reap a great profit at the expense of every stockholder, as indeed they would have done but for my ability to protect the company and its stockholders."

Texas Taking Cars as Fast as They Arrive

AUSTIN, TEX., April 14—During the first three months of the present year there were 316,843 motor vehicles registered in Texas, according to figures just compiled by the State Highway Department. It is expected that during the remaining nine months of 1920 fully 100,000 additional registrations will be made, making a total of approximately 416,000, as compared with 321,800 motor vehicles registered last year.

In every part of the State dealers report an unprecedented large business. This is particularly true of the rural communities. Farmers are buying automobiles as they never bought before. In the oil producing districts of Northern and Central West Texas the demand for high-priced cars is very great.

Calendar

SHOWS

April 21-28—San Francisco. National Aeronautic Exposition. Exposition Auditorium.
Oct. 6-16—New York. Electrical Show. Grand Central Palace. George F. Parker, Manager.
Dec. 10-18—New York. Motor Boat Show. Grand Central Palace.

FOREIGN SHOWS

May 15-June 13—Cars, Parts and Accessories. Antwerp.
June 26-July 25—Commercial vehicles, tractors, camions and engines. Antwerp.
July 9-20—London, England. International Aircraft Exhibition. Olympia. The Society of British Aircraft Constructors.
Aug. 7-Sept. 15—Motorcycles, sidecars, etc. Antwerp.
October—London. Commercial Vehicle Show. Olympia.
November—London. Passenger Car Show. Olympia.

CONTESTS

May 1—Hanford, Cal. Dirt track.

May 31—Indianapolis, Ind. Speedway.

May 31—Brockport, N. Y. Dirt track.

June 1—Omaha, Neb. Truck Reliability Run.

June 12—Uniontown, Pa. Speedway.

June 17—Portland, Ore. Dirt track.

June 19—Ogdensburg, N. Y. Dirt track.

July 4—Tacoma, Wash. Speedway.

July 4—Hanford, Cal. Dirt track.

July 4—Spokane, Wash. Dirt track.

July 5—Batavia, N. Y. Dirt track.

July 17—Warren, Pa. Dirt track.

July 24—Watertown, N. Y. Dirt track.

July 31—Fulton, N. Y. Dirt track.

Aug. 7—Erie, Pa. Dirt track.

Aug. 14—Buffalo, N. Y. Dirt track.

Aug. 20-21—Middletown, N. Y. Dirt track.

Aug. 21—Johnstown City, Pa. Dirt track.

Aug. 28—Canandaigua, N. Y. Dirt track.

Aug. 27-8—Flemington, N. J. Dirt track.

August, 1920—Paris, France. Grand Prix Race. Sporting Commission Automobile Club of France.

Sept. 1—Hidden Tour—N. Y. to San Francisco.

Sept. 5—Targa Florio Race, Sicily.

Sept. 6—Hornell, N. Y. Dirt track.

Sept. 6—Cincinnati, O. Speedway.

Sept. 6—Uniontown, Pa. Speedway.

Sept. 17-18—Syracuse, N. Y. Dirt track.

Sept. 25—Allentown, Pa. Dirt track.

Oct. 1-2—Trenton, N. J. Dirt track.

Oct. 8-9—Danbury, Conn. Dirt track.

CONVENTIONS

April 27-29—Atlantic City. Increased Production Convention, Chamber of Commerce of the United States.

April 29-May 1—Detroit, Mich. Fourth Annual Meeting and Convention, American Gear Manufacturers Ass'n.

May 9-12—Independent American Petroleum Congress, Congress Hotel, Chicago.

May 12-15, 1920—San Francisco. Seventh National Foreign Trade Convention.

May 20-30—Atlantic City. Third American Aeronautic Congress, Aero Club of America.

June 7-10—Indianapolis, Ind. Annual Convention of the Associated Advertising Clubs.

June 22-25—Asbury Park, N. J. Annual meeting American Society for Testing Materials.

S. A. E. MEETINGS

June 21-25—Ottawa Beach, Mich. Summer Conference.

Fuel Developments

Indianapolis Topic

INDIANAPOLIS, April 12—C. F. Kettering, president of the Dayton Engineering Laboratories Co. and formerly president of the S. A. E., will address the Indiana Section of the S. A. E. on "Developments of the Fuel Problem." During his talk he will demonstrate by actual operation some of the peculiar properties of fuels when introduced into the combustion chamber of the automobile engine.

Announcement of the meeting states that the experiments shown will be novel and surprising, and in view of the recent talks given by Kettering on this subject, a very interesting meeting is anticipated. In his laboratories, Kettering has gone into considerable research work on automotive fuels. It is stated that Major Schroeder, in his recent altitude record, utilized some of the results of these experiments. The speaker has developed an entirely new theory for what has hitherto been considered the causes of fuel knocks in automotive engines, and the coming lecture on this subject at the Indianapolis meeting is regarded as of particular interest, in view of his experiments on the characteristics of different automotive fuels which are now in use, or are possibilities for use in the immediate future. The meeting will take place on April 30 at the Hotel Claypool.

FORD TO SEND BAND

DETROIT, April 10—Edsel B. Ford, president of Ford Motor Co., will send the Ford band of 55 pieces and a staff of motion picture operators with the annual

tour of Michigan Pikes Association July 14 to July 29. About 300 will join the tour, which will cover 1359 miles in the 15 days, 574 of which will be in Michigan and 785 in Ontario. A fleet of trucks carrying tents and full camping equipment, together with a farm lighting system, fire engine and facilities for tire and general repairs, and for the installation of shower baths will be at the head of the party.

Curtiss Airplanes

Arrive in Hong Kong

NEW YORK, April 12—Word has been received by Guy T. Slaughter & Co., exporters, of this city, that 11 Curtiss planes shipped by them to the Orient to establish a commercial air route, have arrived at Hong Kong. With them went 16 aviators and mechanics, most of them Americans. The backer of the enterprise, which is the first of the kind ever undertaken in China, is C. E. W. Ricau, a French resident of Macao.

The aerial service will connect Hong Kong and Canton with the Portuguese colony of Macao. Later the company expects to extend its activities to Manila and Tokio, touching at all points on the Chinese coast.

Walter Bonner, a veteran of the navy flying corps, will be general superintendent of the company.

SHIP FISH BY TRUCK

PORTLAND, ME., April 12—A shipment to New York on motor trucks of 22,500 lb. of fish was made to-day by local wholesale dealers. This was made necessary by the railroad strike situation in New York.

Machinery Makers

to Push Production

NEW YORK, April 12—Directors of the Material Handling Machinery Manufacturers' Association have elected as president Charles F. Lang, president of the Lakewood Engineering Co., Cleveland; Rumsey W. Scott of the Otis Elevator Co., this city, has been made vice-president and chairman of the board of governors.

The association announces that more and more manufacturers are discarding pre-war methods and installing "progressive production" methods, but it is stated that there are 216,000 plants in the United States now using handling methods which would be considered obsolete in any modern automobile factory.

High wages and labor shortage, combined with the demand for increased output, are cited as reasons for revolutionizing production methods in these factories.

COMPANY REORGANIZED

LANSING, MICH., April 10—New capital and new blood has been put into Melling Forging Co. and extensive expansion plans have been outlined. The former board and officers resigned, and in their places the following were elected: J. W. Wilford, president; George Melling, vice-president and general manager; E. C. Shields, secretary; H. J. Sproat, treasurer. The officers and W. H. Newbrough constitute the board, assuming their duties immediately. Edward VerLinden, general manager of Olds Motor Works, also is interested in the company.

AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

VOL. XLII

NEW YORK—THURSDAY, APRIL 22, 1920

No. 17

Have You the Elements of Discontent in Your Plant?

Any strike may serve as a basis for the study of your own plant, if you will go into it from the standpoint of the men, analyzing and looking into your organization with the strike lessons in mind. Some recent walkouts, including the unauthorized outbreak on the railroads, may serve this purpose

By Harry Tipper

THE circumstances surrounding the outlaw railroad strike and the attention which it has received in the newspapers, indicate again the disorder which exists in the ranks of labor, the lack of allegiance to any working object and the difficulty that exists in providing settlements which will operate justly for all employees concerned in the matter. There is no doubt that, in respect of the position of other railroad employees, the yard men and the switch men have some grievances, and have not benefited equally with other branches of railroad employment.

There is no doubt that the strike was partly the result of radical sentiment; there is, of course, always a certain proportion of radical sentiment in labor as in other bodies. The strike, however, accumulated its speed because of the general dissatisfaction of the worker and its beginning rests in the psychological causes which are operating all through the ranks of labor and find their expression when any circumstance offers an opportunity.

The general attitude is indicated by two incidents which occurred in the writer's experience recently.

Just the other morning, some express men with their helpers were moving packages from a warehouse in the downtown district of New York and, in the intervals of getting the packages moved, three of

them were standing close to the little office in which one of my friends worked. One of the express men remarked to his helper, casually, in the course of conversation, that it was about six weeks since they had had a strike and that it was almost time to look for another one. The whole expression and its casual occurrence resembled the statement a man might make about a holiday.

Another little incident which happened lately emphasized the point of view expressed in this remark. A few days ago some of the water-front men went on a strike. I asked a young man whom I knew among the strikers, what was the reason for the strike? His reply was interesting. He said, shrugging his shoulders, "Oh, I don't know, I guess they just decided it was about time to have a strike." The attitude of these men in respect to their work struck me as remarkably like the attitude of the youngster to his school. Any legitimate excuse for staying away from school is a point of relief to the average youngster, and these fellows evidently considered that a strike was a legitimate excuse for staying away from work and getting their relief. There was no incentive to these men in the work and no incentive to remain at work if an avenue of escape was provided.

This matter of incentive to work is an important one. It affects so many operations in industry and has so direct a bearing upon production.

In these articles we have stated, from time to time, that there is no incentive for work as such. It is necessary to emphasize the point that there is no incentive to labor in the human being, except as that labor is necessary to the accomplishment of an object. The importance of the object and the visibility of the object to the worker affect the desire for work and the incentive to work with full capacity.

Writers on occupational values to young men in their advice talk much about being interested in your work, but the interest in work comes from being interested in the object of the work and, without a knowledge of the object and a vision of the objective, the incentive is limited to the amount of labor necessary to get by and to provide the amount of money required to live on.

Every man who has acquired any responsibility for industrial operations in connection with his work knows how the necessity for accomplishing an object within a given space of time will drive tired muscles and tired brain into activity until the object is secured. Remove the object from the mental horizon or put it so far away that it is almost invisible, and there is no possibility of developing the same capacity for accomplishment.

As the intelligence of the worker increases, and he becomes aware of his ambitions, the dissatisfaction with the character of his work is not likely to decrease, but is likely to increase unless he can be provided with a sufficient objective, to transfer the performance of the work into the accomplishment of a reasonable object.

Whatever may be said as to the value of the one-man-one-job method of organization, or as to the productive efficiency of the sub-division of labor, it is obvious that the increase in the regularity and monotony of operations, the sub-division of the work into more and more operations, tends to remove the object of the work further and further from the individual worker's horizon and to make the immediate operation less significant to the worker. This is not only true theoretically from a consideration of psychological necessities of the worker, but it is to be observed practically in the establishment of minimum rates of production, in the characteristic elements of production curves and in the large turnover which occurs in most industrial operations. It is obvious that the sub-division of work due to the specializing of operations has been carried sufficiently far to overtake the advantage secured from the machine development, and the result is to be found in the general lessening of production efficiency which was beginning to be felt before the war and which has been accelerated since the war ended.

It is not probable that the sub-division of labor can be eliminated or even largely restricted because of its defects, but its defects should be thoroughly studied and measured so that the rotation of labor can be instituted wherever it is possible, to limit the defects of the system, and where this cannot be done other objectives can be provided for the worker which will to some extent overcome the conditions growing out of this extreme sub-division.

Of course, in strikes like the railroad strike, which was referred to in the beginning of this article, the question of the subdivision of labor does not enter into

the matter so seriously. It is rather a question of the disagreeable character of the task, the lack of any sense of loyalty or allegiance, dissatisfaction with the character and object of the work, and a general feeling that the work itself provides no hopeful possibility of increased development.

These things are not expressed, they are more frequently subconscious in their influence upon the action. They arise out of the same subconscious necessities which govern the production conditions we are facing, where the work has been greatly standardized and subdivided; although they are brought into activity by different circumstances. The visible effects are the tendency to quit work for apparently trifling disagreements, the lack of interest in the work, and the lack of any incentive to continue working.

It is not only that the man desires to escape from such work as much as he can without starving, but it is that there is no incentive for good work where there is no visible object in the work. There is a general complaint of the decrease in character of workmanship as well as the decrease in the stability of the worker. These complaints existed in Great Britain for a good many years before the war, and we in this country, were inclined to congratulate ourselves that we did not have the labor conditions which existed there.

What they have been noticing in that country, the decrease in character of workmanship, as well as the decreased stability of the worker, is becoming evident with us and is likely to increase right along. It cannot be stated too definitely that there is no incentive to do good work where the object of the work is not visible, is too insignificant or cannot be understood, and there is no incentive to remain at work under these conditions.

The quantity of production, the amount of production and the stability of production are all involved, and are all affected by these conditions. When the escape from work becomes the most potent desire of the worker, and the work itself begins to look like servitude in the way that school looks to most young children, then it becomes time to study the reasons for this attitude so that production may not be too strictly limited and quality more difficult to maintain.

It is an amazing thing to examine the organization in a larger modern industrial plant and consider the size and detail of the system that must be provided merely for the purpose of insuring quality and accuracy in the work.

Complaining about the lack of interest on the part of the worker will not do us much good, and kicking because the union organizations don't extend their responsibilities in this direction will not be of much service to the manufacturer. If we had a lot of machinery that was not sufficiently productive and that got out of order frequently, we would use all the brain capacity we could command upon the improvement of that equipment. Humanly our industrial organizations are producing badly, they get out of order very frequently and we are under the necessity of reconstructing them constantly, yet, we assume that the troubles can be found without study and the remedies determined by snap judgment or prejudice.

When the individual workman will go out on strike without knowing much about the reasons for it and when he will approach a strike as the expressman did, in the spirit of relief, there is something radically wrong with the character either of the supervision or organization, and something

amiss with our measurement of the factors. Of course, the basis of all the improvements which can be made in the human development of organization is education, the provision of a better ground-work of common understanding. This education must lead into a study that takes in the detail of human labor with the same conscientious attention as that accorded to the study of machinery and worked out in the detail of machine construction and operation.

It makes little difference whether the manufacturer thinks the attitude of labor is justified, production is controlled finally by the human side of industry and the character and amount of the production by the way in which the laborer approaches his work. The attitude of the laborer in connection with his work in reducing the per man per hour production in most plants is keeping the turnover very high and is lowering the quality of the average worker. These effects are suffi-

ciently practical and important to demand the right kind of study.

The sub-division of labor is not justified merely because we use it to its present extent, it must be continued of course very largely, but it should be supplemented by the rotation of labor where possible, and, where it cannot be modified, efforts should be undertaken continually to provide the worker with some other objective, either of organization or department, or in some way that will enable him to transfer the object to his work and overcome the specialized character of his operations.

While a great deal has been written about the industrial organization from the human standpoint in the last two years, little has been said about the attitude of the worker to his work as a daily matter of operation, but this is no unimportant part of the study. It is the individual attitude toward the work which finds its expression in the mass attitude toward strikes, turnover and other industrial interruptions.

The Human Side of Engineering

SPEAKING of the coal industry, Herbert Hoover said recently: "Broadly speaking, here is an industry functioning badly from an engineering, and consequently from an economic and human standpoint." The statement is a significant one coming, as it does, from a man prominent both as an engineer and as a practical business administrator. It reveals a point of view not sufficiently held in the automotive industry; that is, manufacturers do not always realize the direct relation between the engineering and human functioning of a plant. They are often content to work out carefully the engineering phases of production and to care for the human element only as certain parts of the engineering development happen to affect it. Two plants, one large and the other small, manufacturing the same automobile part, give a concrete illustration. The attitude of the managements of the two concerns toward their labor in general is almost identical; each believes that the only way to handle their men is with the "big stick." Yet there is little comparison between the working conditions of the two. If a man had his choice, he would inevitably prefer to work in the larger plant. The cleanliness, the light, the proper arrangement of machinery that makes for safety as well as for efficiency, and the improved conveyors for the handling of material that make work easier as well as more rapid—these things are present in the large plant and are lacking to a considerable extent in the small one.

Considering that the attitude of the two managements toward labor is identical, it is logical to conclude that the better conditions in the large plant are due entirely to their efficacy in aiding production. The large plant has found by experience that certain things, such as good lights and unobstructed passageways, are necessary to efficient production; the small plant is pounding along seemingly ignorant of the fact. If changes ever come in the small plant, they will probably be the result of discoveries by the production manager, that better light, for instance, means better production. Had the large plant approached its production from the human, instead of the engineering standpoint, the same conclusions concerning light, cleanliness, etc., would have been reached. If, however these definite aids to better production, which embody to so large an extent the human element, have been developed by viewing the problem

purely from an engineering standpoint, it would seem evident that a careful study and investigation of production from the standpoint of the human element itself would reveal many other factors which would further increase quantity and quality production.

Even in the large plant, however, it is the practice not to study the human side or to attempt to investigate its relation to production; the management simply waits until some production feature falls down because of a conflict with the human side and then remedies that particular defect. Thus, the large plant is no further along mentally than the small plant with all its inefficiency. Both fail to realize that a study of the human element in production problems is necessary.

The significant word in the statement of Herbert Hoover, quoted before, is consequently—"if an industry is functioning badly from an engineering standpoint, consequently it is functioning badly from a human standpoint." Moreover, a recent survey of a number of representative automotive plants indicated that the reverse is also true; that is, if the plant is functioning badly from a human standpoint it is found to be functioning badly from an engineering standpoint. Intelligent and honest methods of handling industrial relations were found to go hand in hand with effective production methods.

Aluminum Crankcase Cast on Iron Cylinder Block

ACCORDING to an English patent recently issued to S. S. Guy, the upper half of the crankcase is cast on to the cylinder or cylinders, the latter being placed in the mold for that purpose prior to the casting operation. By this means the rigidity and other favorable features of the unit construction are secured in conjunction with a choice of different materials for the two parts. The cylinder is provided with an extension at the base, and with an outwardly inclined flange. In order to afford an intimate and firm connection with the crankcase to be cast on it, the flange and extension may be rough machined, and for the same purpose the latter may be also formed with a series of annular grooves.

New Engine Has Unusual Oil System and Valve Setting

Several interesting results are obtained from these features of the four-cylinder general purpose engine described in this article. It has the additional feature that the exhaust and intake manifolds are integral, according with the tendency to assist carburetion. Oiling is by force feed.

A NUMBER of unusual engineering features are incorporated in the Turner-Moore, 3½ x 5 in., four-cylinder general purpose engine. This powerplant peaks at 2200 r.p.m., at which speed 37 b. hp. are developed. The torque curve is flat between 800 and 1300 r.p.m. the maximum torque being 83 lb. ft.

One of the distinguishing features is the hollow crankshaft. It is 2 in. in diameter at all bearings and is used in connection with a complete pressure feed oil system to all bearings and to the timing gears. There are no oil tubes, all of the leads being drilled. Another feature is the tunnel construction in which are housed the camshaft and bearing points of the tappets. This construction is such as to permit the operation of the camshaft and cams in an oil bath.

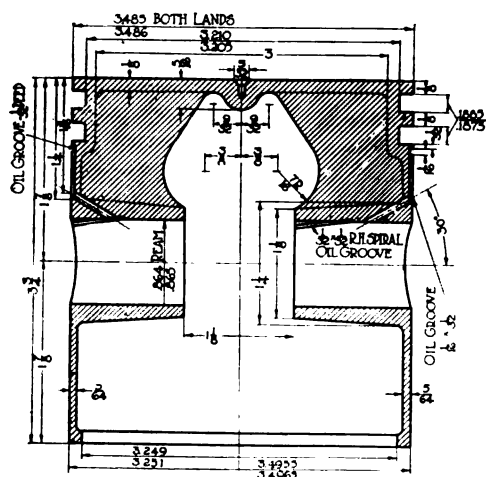
A rather unusual feature is the accentuated inclination of the valves. The purpose of this is to secure better scavenging, inasmuch as it permits the exhaust gases to be swept off the top of the piston directly into the exhaust passage and also to secure a shorter combustion chamber. The inclination also permits of increased water space around the valve stem guides and brings the spark plugs closer to the center line of the pistons.

In accordance with the tendency to make provisions in the intake manifold for assisting the carburetion, the exhaust and intake manifolds are integral. The intake manifold is on top and its lower side is heated. One noteworthy manufacturing feature is the use of a separate bell housing casting. This permits easier manufacture and cheaper castings. Another feature is that the starter flange can be furnished on either side. This is done by simply shifting the boss on the pattern, which is constructed so that this can be accomplished readily.

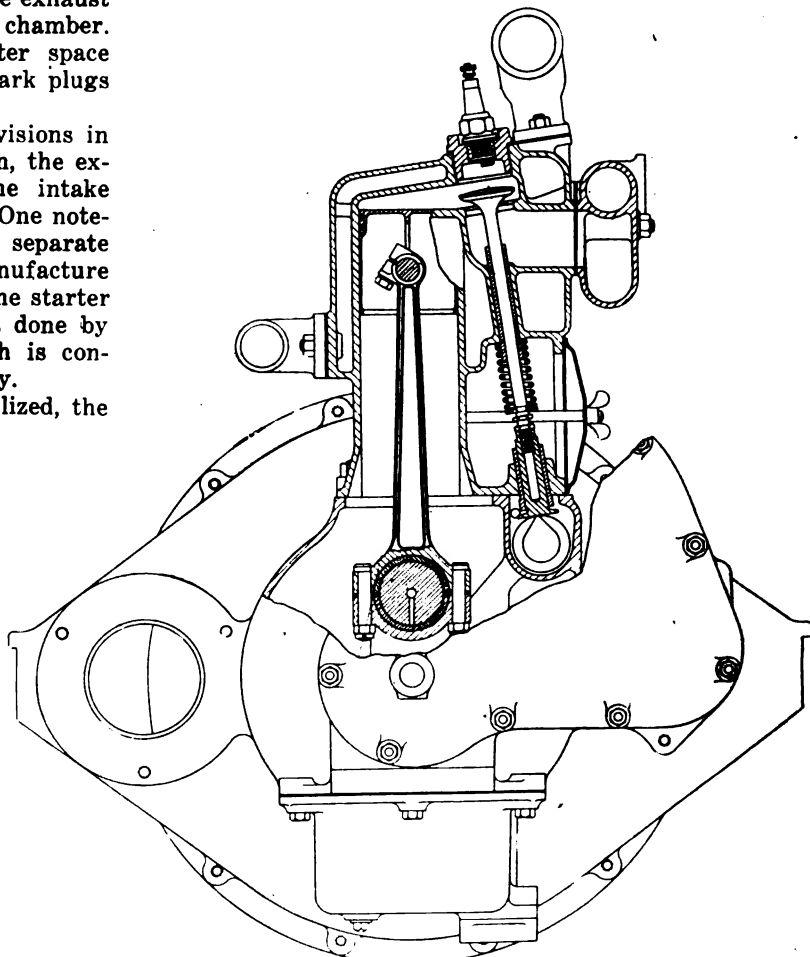
Either battery or magneto ignition can be utilized, the

drive, consisting of helical gears and a vertical shaft being located at the rear of the cylinder block. A balanced drive is secured by putting the gear oil pump on another vertical shaft which extends to the bottom of the oil pan.

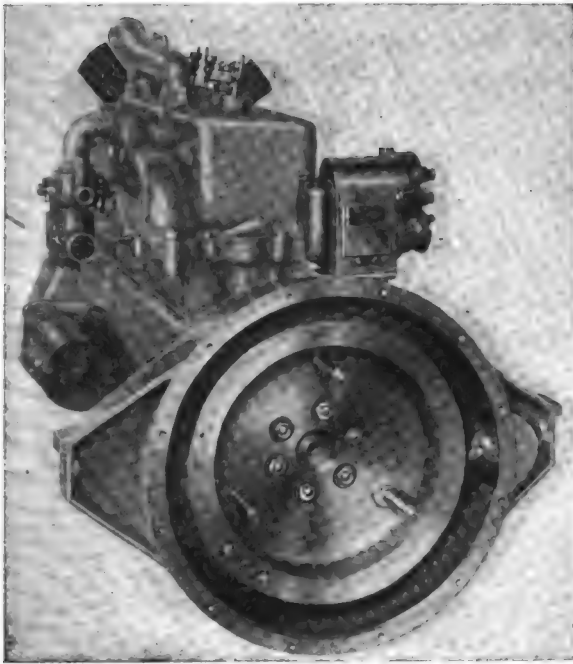
The cylinders are cast in block of semi-steel. The crankcase is of grey iron with provision made on the left side, front end, for any standard generator with No. 2 S. A. E. mounting flange. The pistons are semi-steel, the piston pins being held rigid in the connecting rod with the bearings in the piston. The sectional drawing of the piston herewith shows that it is heavily webbed, the web, however, being split at the center so as to avoid distortion due to expansion. The piston is $3\frac{1}{4}$ in. in length overall and has two rings located at the top end. Below the lower ring there is an oil groove $\frac{1}{32}$ in. deep around the entire piston and at the point directly above the piston pin there is a slot cut in the side of the piston, the lower end of which is in connection with a drilled lead to the top of



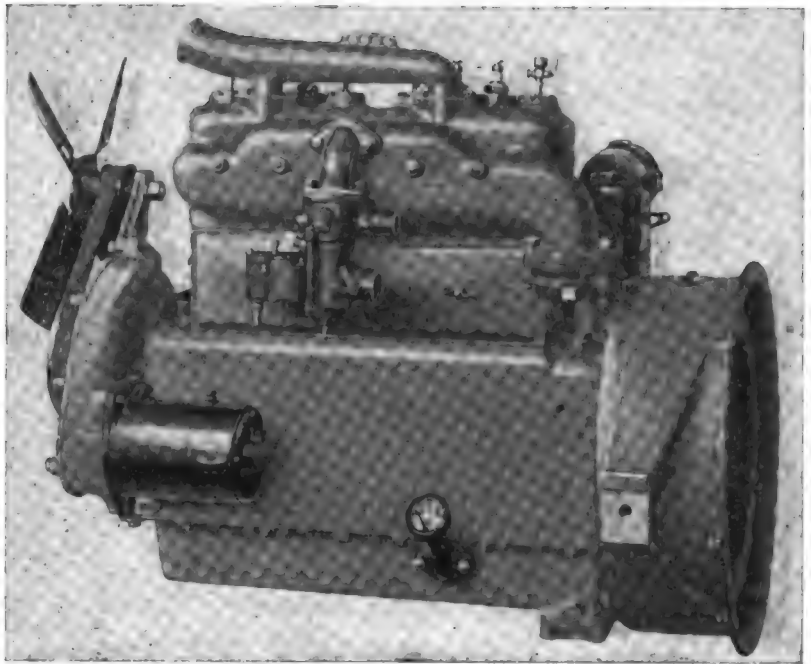
Section through Turner-Moore pistons, showing web construction and oil relief



Cross section. Note inclined valves



Turner-Moore engine, showing transverse magneto mounting, making brake adjustment accessible; battery ignition optional



Side view of Turner-Moore engine, 3½ by 5 in. type, showing integral intake and exhaust manifold, carburetor and generator mountings

the piston pin bearing. The effect of this is to force oil to the top of the piston pin bearing on every up stroke. The oil groove is 1/16 in. wide and 1/32 in. deep.

The connecting rods are 10 in. center to center, I-beam section, and the crankshaft is a 40 point carbon, heat treated steel forging, mounted on three bronze back bab-

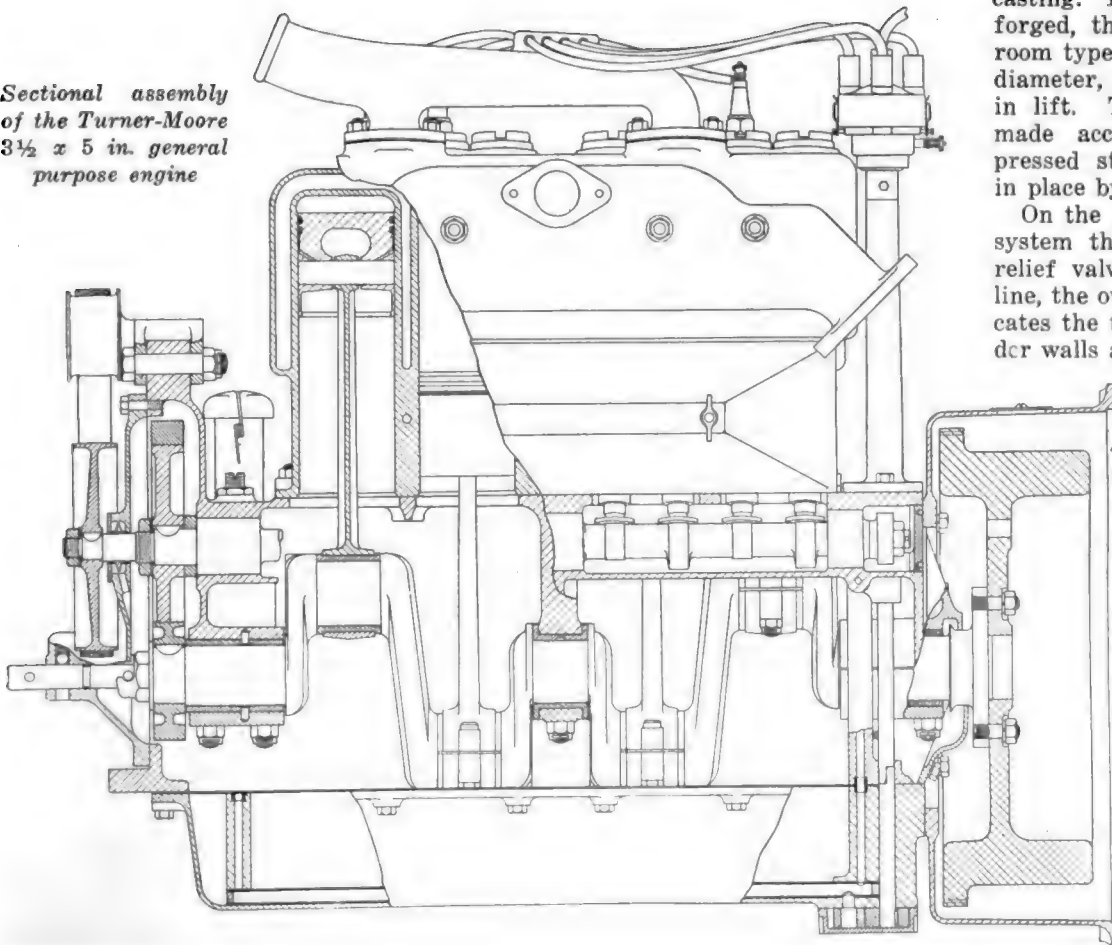
bitt-lined bearings, equipped with laminated shims for adjustment. The bearing dimensions are (front to rear): 1 7/8 x 3 1/8, 1 15/16 x 1 3/4 and 2 x 3 1/4 in. The connecting rod bearings are 2 x 2 in. The valves are driven by a set of three helical gears, the crank and generator gears being steel forgings and the camshaft gear a semi-steel casting.

The camshaft is integrally forged, the followers being mushroom type. The valves are 1 1/2 in. diameter, clear opening, with 5/16 in lift. The valve adjustment is made accessible by removing a pressed steel cover which is held in place by a nut and lock nut.

On the pressure feed lubricating system there is a ball check and relief valve at the end of the oil line, the overflow from which lubricates the timing gears. The cylinder walls are lubricated by oil mist

thrown from the connecting rod bearings, and the remaining bearings are taken care of by direct pressure feed. Cooling is by thermosyphon or pump circulation, as desired. The water jacket space is exceptionally large, holding 7 qt. of water. Pump circulation is required only for extremely heavy duty work, such as tractor service. The weight of the engine, with cast iron crankcase, oil pan and flywheel housing is 440 lb.

Sectional assembly of the Turner-Moore 3½ x 5 in. general purpose engine



New Tractor of Frameless Type Has Unit Construction

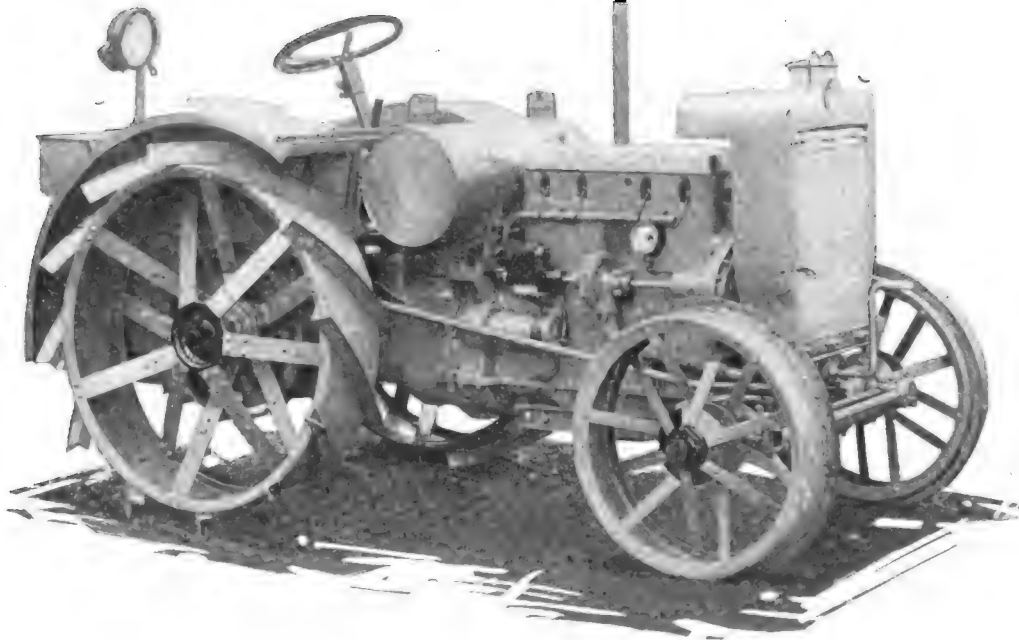
The description herewith sets forth the design features of one of the new models on exhibition at the recent Kansas City show. The engine for this machine was described in the issue of April 15.

ONE of the most attractive designs among the new tractors at the recent Kansas City Show was the W-S-M, manufactured by the Wellman-Seaver-Morgan Co. The machine is new all through, including the engine, but the engine and the rest of the tractor are the work of different designers and the two will also be built by different departments of the works. The tractor is the design of John Riise. It is of the frameless or backbone type, has a three-speed change gear, a first reduction by worm and wheel with final drive by spur gears, and is remarkably short for the size of engine carried, the wheel-base being only 75 in.

The unit principle has been carried out, the whole assembly consisting of nine different units, as follows: The

pendently without disturbing any of the other units. If the powerplant as a whole is removed, the rear portion of the tractor balances on the axle in such a way that it can be rolled around on the rear wheels.

The engine is of the 4-cylinder block type, $4\frac{1}{4} \times 6$ in., and has been described in a recent issue. An air washer is to be fitted, but this was not installed on the model exhibited at Kansas City. Ignition is by a Bosch high tension magneto with impulse starter. An electric starting and lighting equipment of the 12 volt two-unit type is standard equipment. A centrifugal governor holds the engine speed down to 950 r.p.m. Lubrication is by force feed to all engine bearings, all oil conduits being cast integral



Wellman-Seaver-Morgan tractor

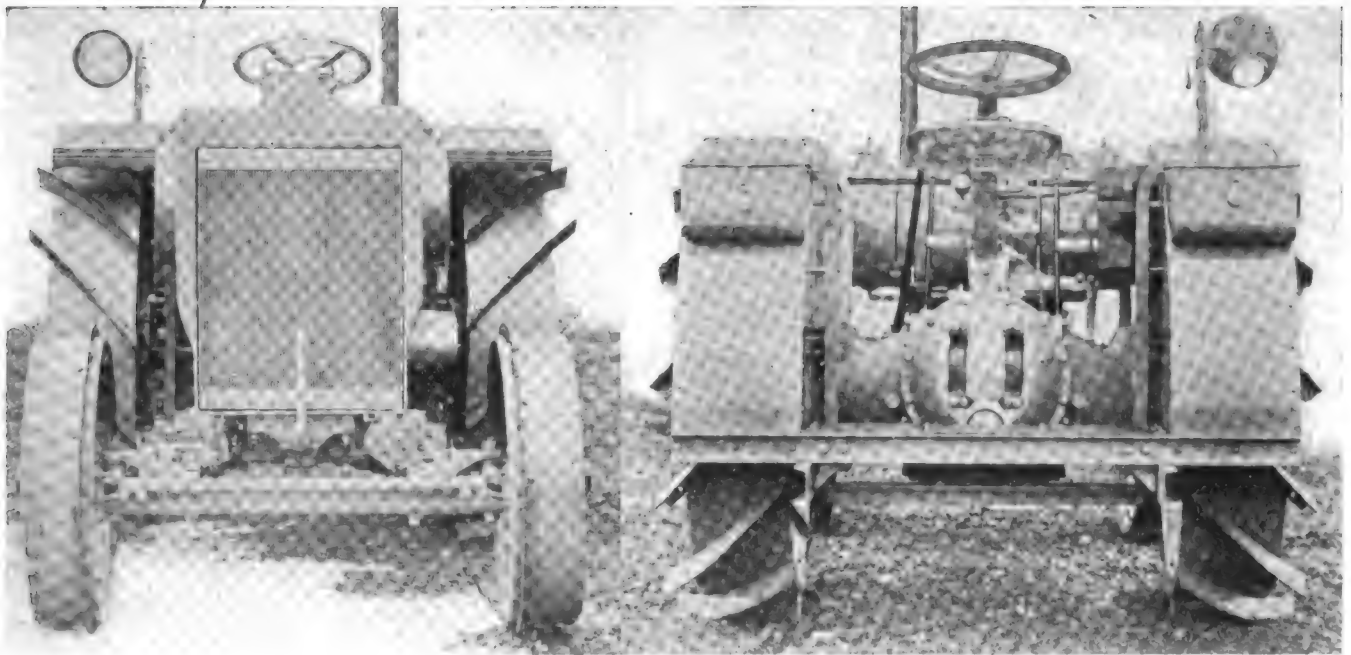
engine unit with radiator, fuel tank and air cleaner; the front axle unit, including the built-up axle, cross spring, steering knuckles, radius rods, bearings, thrust washers and wheels; the rear axle unit, including the axle, bull gears, housings, bearings, thrust washers, wheels and brakes; the clutch unit, including the clutch brake; the main case unit, comprising the change speed gears and control; the differential unit, including the worm, worm wheel, differential and bull gear pinions and differential oiler; the pulley unit, comprising the pulley shaft, spiral bevel gear and bearings; the steering gear unit, including the case, bevel segment, pinion, column, arm, steering wheel, seat spring and seat, and the fender unit, which combines in one the fenders, platform and drawbar.

By removing 12 bolts, the engine, rear axle and differential units can be removed from the main case, each inde-

pendently without disturbing any of the other units. If the powerplant as a whole is removed, the rear portion of the tractor balances on the axle in such a way that it can be rolled around on the rear wheels.

The dry disk type of clutch is used, comprising eight disks. The clutch is held in engagement by eight sets of two concentric springs, the clutch being non-adjustable.

The transmission is of the sliding pinion type and gives three forward speeds and one reverse, the intermediate speed being the direct drive, which is used for ordinary plowing. When this is in engagement there are only two reductions in speed from the engine crankshaft to the driving wheels. The low speed is $1\frac{1}{2}$ m.p.h., the intermediate or plowing speed 3 m.p.h. and the high speed 6 m.p.h. There is only one countershaft in the transmission and there are sliding gears both on the main shaft and on the countershaft. The direct drive is obtained by means of an internal type of positive clutch. There is a sliding pinion on the



Front and rear views of W-S-M tractor

main shaft, which when in its most forward position gives the direct drive. Its next position to the rear corresponds to the reverse drive and its rearmost position to the low speed. The high speed is obtained by shifting a sliding gear on the countershaft into mesh with a pinion on the main shaft. The teeth of this pinion are splines cut on the shaft.

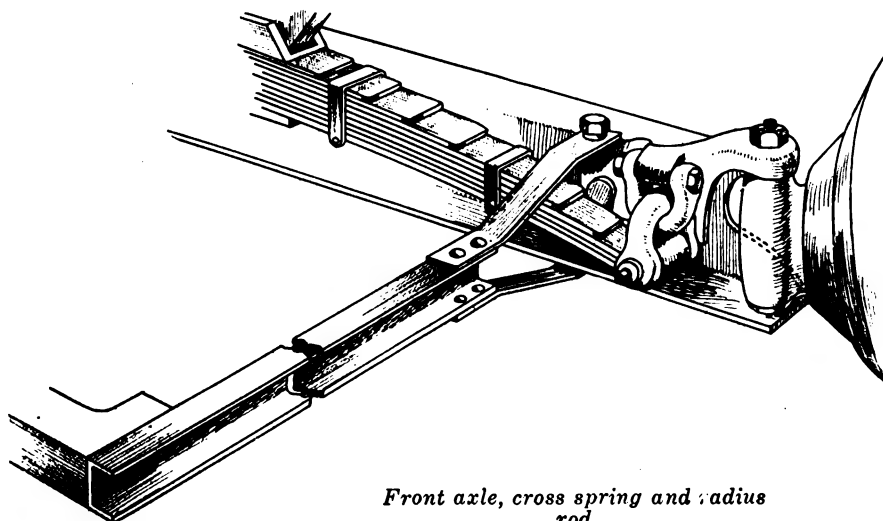
The housings for the clutch, transmission and the differential are all semi-steel castings. The differential is a very compact unit and, together with the final reduction rears, is supported by a gear carrier which is bolted to the rear of the axle housing. There are two large ball bearings in the final drive, as well as Hyatt roller bearings. The ball bearings are held in rings with lugs on opposite sides by means of which they are bolted against a seat in the casting. A reduction of $11\frac{2}{3}$ to 1 is obtained by means of the worm and wheel and the total reduction between engine shaft and rear wheels is 23 to 1 for the high gear, 46 to 1 for the intermediate and 92 to 1 for the low gear.

The assembly of the tractor starts with the transmission case, which contains the change gears. The engine is assembled on this from the front and the worm and

differential from the rear, after which the axle housings are secured to the sides of the differential housing. As already pointed out, the belt drive forms a separate unit. The secondary shaft of the change gear extends forward through a partition in the housing and at its forward end carries a bevel pinion meshing with a bevel gear on the belt pulley shaft. The bevel gear on the power take-off shaft can be moved into and out of mesh with the driving pinion by means of a lever having a motion of 170 deg. which locks the gear in position.

Individual brakes are fitted to the rear driving wheels. These insure more positive steering in loose soil than would be possible with the steering gear alone, and in addition they are of service in correcting any tendency for the wheels to leave the furrow in plowing due to the better grip on the ground of the wheel traveling in the furrow. A slight pressure on the pedal of one of the brakes tends to correct this tendency.

Mounted on top of the gear box is the steering gear, which is of the motor truck type. The driver's seat is mounted centrally on the transmission case and the control devices are conveniently arranged on both sides. A feature of the individual brakes is that they can be operated either



Front axle, cross spring and radius rod



Front wheel with skid ring

by hand or by foot, the brake levers being provided with pads so as to make them controllable by means of the foot. There is also provided a simple chain locking device for the brake levers, this consisting merely of a length of chain secured to a crossbar which can be extended rearward and hooked to the slotted top end of the brake lever. The clutch is operated by means of a similar lever also provided with a pedal pad, and can be locked in the out position by means of a hook over the crossbar. The engine throttle is operated by a pedal with two pads and therefore can be operated by means of either foot. The driver's seat is of large size and is supported on a rearwardly extending bar. A 22 in. cast aluminum wheel is used for steering. The steering gear is of the bevel pinion and sector type and is inclosed in a housing which also forms a hand hole cover for the transmission.

Wheel fenders, drawbar hitch and platform are all formed in one and are supported by 3 in. and 4 in. channels. Two tool boxes with locks are conveniently mounted on the fenders, one of these boxes serving for tools for the implements and the other for tractor tools. The battery box is mounted on the inside of the wheel house.

A Z bar is used in building up the front axle, the axle ends being of cast steel. A plain pivot pin is screwed into the cast end and secured by a lock nut. There are bushings in the knuckle at both top and bottom, with a nut on the lower end of the knuckle pin. Under this nut comes the flange of the Z bar, then follows another nut, hence the knuckle pin is used in holding together the parts of the built-up axle. A case hardened cup is provided to obtain the proper bearing surface between the bushing and the steering head, this cup also excluding dirt. Another cup is provided at the bottom of the knuckle for the same purpose. The steering motion is limited by the steering arm coming against the Z bar.

The forward end of the tractor is mounted on a half elliptic cross spring with universal shackles at both ends, the shackles connecting to the cast axle ends. The spring seat at the center of the spring has a supporting pin 1 in. in diameter which swivels in the spring, being clamped in

the engine bracket which rests on the spring. This pin is turned with a grooved knob at one end so it can be easily withdrawn when necessary. To give stability to the front



Quick-acting filler cover

axle, connection is made by two channel bar radius rods which straddle the axle, while the rear ends are connected to the front of the flywheel housing by means of a 1 3/4 in. ball joint. This gives an absolutely flexible mounting for the forward end.

The radiator rests on an extension of the cam gear housing cover, being held in place by two through bolts. The cast housing of the radiator is shaped to form a tunnel for the gear driven fan. The entire cooling system has a capacity of 17 gal. of water, of which 6 are carried above the radiator core. There is a partition in the casting at the top of the core. The pipe connection to the radiator at the top is by a through bolt. A large size radiator filler is provided, the cap of which is hinged and held in place by a wire hoop. The core of the radiator is of Modine manufacture.

A supply of 25 gal. of kerosene and 5 gal. of gasoline can be carried in the fuel tank, which is mounted on a saddle over the flywheel housing. This tank is of cylindrical form and is provided with quick acting tank covers similar to the radiator cover in construction.

Starting and lighting switches are mounted on the crossbar behind the fuel tank to which reference has repeatedly been made.

As exhibited at Kansas City, the machine weighs 6000 lb. This, however, was the experimental model and it is hoped in regular production to get the weight down to 5500 lb. The design is substantial throughout, as may be judged from the fact that the rear axle shafts are of 3 in. nickel steel. The driving wheels are held on the shafts between two tapers with splined fittings, nut and lock nut.

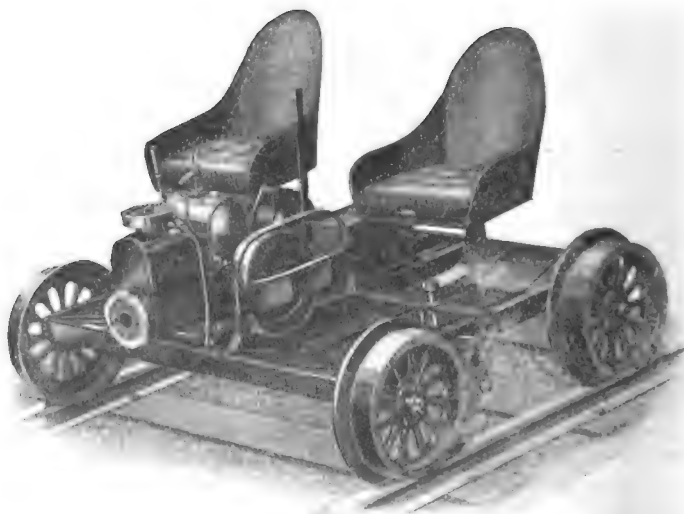
Substitute for Hand Cars

MANY of the old-fashioned hand cars used by section gangs are being equipped with engines, or being replaced with new cars of the motor type. In fact, this comparatively new field of the automotive industry is said to show signs of broadening in the near future and further development may be expected.

In connection with this form of transportation, trailers or push-cars are being used to some extent, and are loaded with ties or other material for section work and readily moved to the scene of operations. Railroad motor cars are also being used more than formerly, and have the advantage of placing the inspector close to the rails and enabling him to cover conveniently a large extent of trackage in a day. As such cars can be stopped within a distance of two or three rail lengths, collisions are avoided even where traffic is heavy, for the railway motor car is readily reversible and easily sidetracked.

An engine that has been utilized extensively in this field is a small 4 and 6 hp. type built by the Fairmont Gas & Ry. Motor Car Co., who not only convert old hand-cars but also make the new motor substitutes. Battery ignition is ordinarily employed, but a magneto is

installed when desired. The 4 hp. engine weighs 320 lbs. and the 6 hp. 420 lbs.



Fairmont motor-propelled railway inspection car

The Marine Engine as Great Britain Has Developed It

This review of English practice was written after the Olympia show at London. Some of its recommendations and criticisms might be applied to the American output. Mr. Bourdon's suggestions concerning the semi-Diesel engine are interesting and timely.

By M. W. Bourdon*

QUITE a small minority of British motor boat and marine engine manufacturers cater to the prospective purchaser who requires a lightweight four or six-cylinder engine on the lines of those utilized in private cars. The majority have followed or are running on lines parallel with truck engines; their products are medium and heavy weight units designed to run at normal speeds of between 600 and 1000 r.p.m. with gasoline or kerosene as fuel. There is no evidence of any attempt to keep down weight of either stationary or moving parts. Durability above everything else has been considered; comparatively low specific output and a low rate of revolution with direct drive to the propeller are common features. Few attempts are apparent to clean up exterior design and to provide all moving parts with automatic lubrication.

The average British marine engine, in fact, resembles the truck engine of 10 years ago far more than it does the car engine of 1920. There are exceptions to this general rule. In isolated instances, a type running at somewhat higher speed has been evolved, and there is an incipient tendency to follow airplane practice in utilizing reducing gears—an indirect drive—between crankshaft and propeller. Thornycroft, for example, has attained increased propeller efficiency in this way, and, with a crankshaft speed of 1400 r.p.m. in one type of engine, has a propeller speed of 350 r.p.m. The transmission loss in the reduction gearing is amply compensated for by increased propeller efficiency, quite apart from the better results in power development by the engine.

The tendency just outlined applies primarily to sets intended for craft of slow or medium speed, for the advantage of reduction gearing has yet to be demonstrated in 20 to 30 knotters and in boats of even higher speeds. But when one realizes that an engine speed of 1200 r.p.m. is considered high enough for even the fastest of pleasure craft with direct drive, it is quite evident that in launches and small cruisers, whose top speed through the water is 8 to 12 knots, an advantage would accrue if reduction gears gave a propeller speed of under 500 r.p.m. Therefore, it would seem to follow that better results would be obtained by maintaining that lower propeller speed with an engine running at 1800-2000 r.p.m.

Automobile Types of Engines

It has been found advantageous to adopt high speed steam turbines with reduction gears in large vessels, so why not follow the same line of progress and utilize the lighter, more efficient and higher speed automobile type

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of engine with a reducing gear, instead of continuing to use with direct drive the heavy, inefficient and low speed 1910 truck type of power plant? That appears to represent the line of thought of a small section of British motor boat engine designers. But the majority still seem to be satisfied with the line of least resistance—an unsatisfactory compromise between a low inefficiency of propeller and engine.

Mounting the Accessories

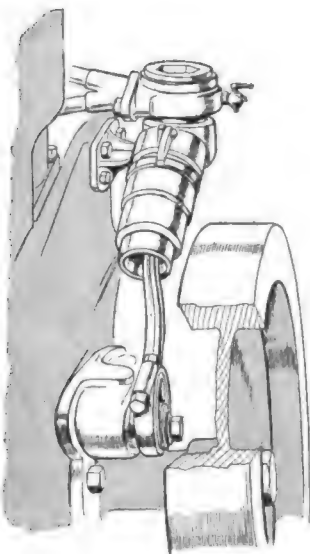
Admitting for the moment the advantages obtained in the way of accessibility by extended drives for such units as the magneto, water pump, oil pump, etc., bringing these items where they can be reached and removed if necessary without disturbing any other part, there is no excuse for the almost unlimited number of subsidiary bearings and details which require periodical if not frequent attention with an oil can. The use of compression grease cups for the journal bearings of crankshafts, a feature evident in quite a number of engines, seems to imply a decided lack of confidence in the system of oil distribution provided by the oil pump, although one maker informed the writer that he used the greasers, not so much for the supplementary lubrication they supplied, but because the grease prevented oil from leaking from the outer ends of the bearings.

But, whatever the failings of British motor boat engine designers in regard to the reduction of weight, hesitancy to utilize higher engine speeds, and failure to provide a neat arrangement of exterior details, there can be no gainsaying the fact that, taken generally, they provide a reliable and durable outfit. The majority, too, have evidently given more than casual consideration to the matter of internal lubrication; it is unusual to find a simple splash system relied upon, and in a great number of models the oil is forced to the main journal bearings and through a drilled shaft to the big-ends. One or two carry the lubricant under pressure to the piston pins.

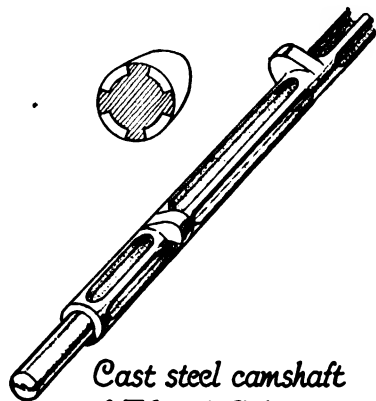
Ignoring two-cycle engines, which almost universally have splash lubrication, the oil being introduced either from a drip feed into the induction pipe or mixed with the gasoline in the fuel tank, the following percentages of lubrication systems may be applied:

- Drip feed and splash, 20 per cent.
- Circulating splash (troughs for main and big-end bearings) 20 per cent.
- Forced to journals and troughs for big-ends, 25 per cent.
- Forced to journals and big-ends, 30 per cent.
- Forced throughout, including wrist pins and camshaft, 5 per cent.

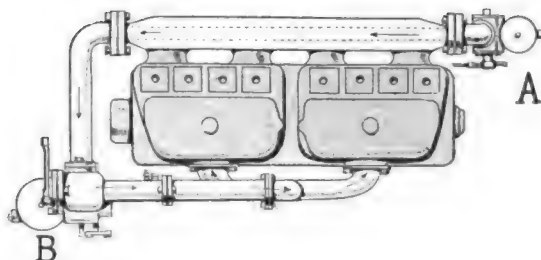
Fittings of the British Marine Engines



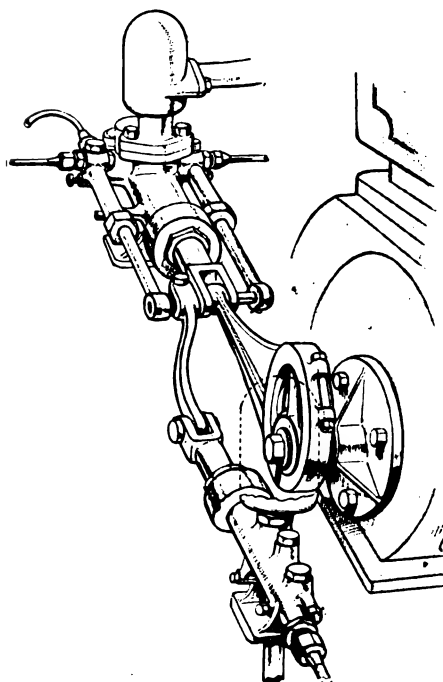
Ailsa Craig eccentric piston type water pump.



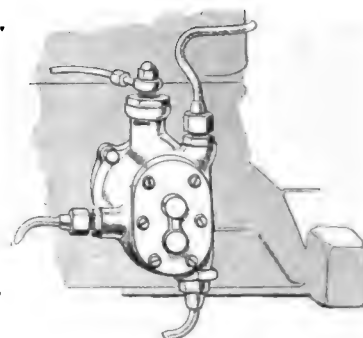
Cast steel camshaft of T-head Spherota marine engine.



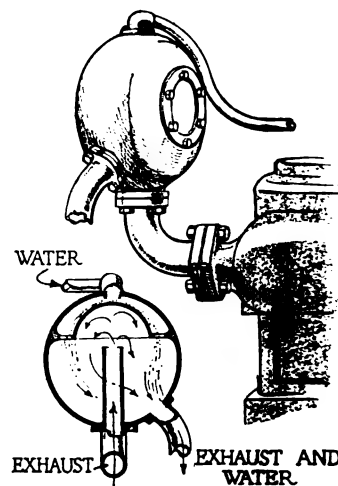
Plan view of Aster kerosene and gasoline induction system. A, kerosene carburetor; B, gasoline carburetor with cut off valve independent of throttle.



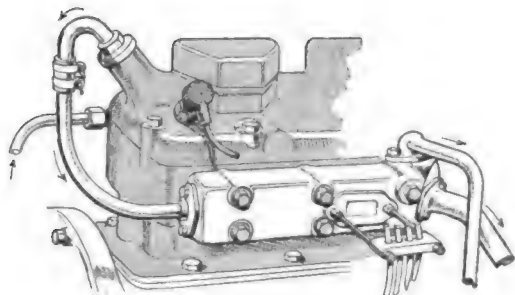
Single eccentric drive for oil, fuel pressure, water circulating and bilge pumps on Djinn engine.



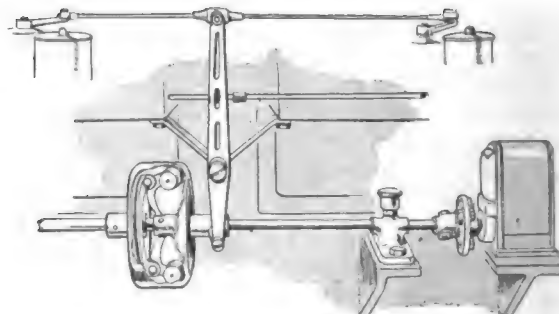
Combined gear type oil pump and plunger pump for fuel pressure on six-cylinder Wolseley marine engine.



Perspective view and section of Atlantic exhaust cooler.



Watercooled exhaust manifold on 7 h.p. four-cylinder overhead valve Wolseley.



Centrifugal governor of throttle on magneto drive shaft of Atlantic marine engine.

Attempts have been made by individual manufacturers to standardize a definite number of types, usually two or three, the units of each type having the same bore and stroke with as many interchangeable parts as possible for the varying number of cylinders—1, 2, 3, 4 and 6. As a result, the block cast four cylinder engine is rarely seen, while a six cylinder block does not exist. Cylinders are either separate or pair cast, although the latter are in the majority. Approximately 20 per cent have T heads, the remainder being divided as follows: L heads 58 per cent, superimposed valves 14 per cent, both valves overhead 8 per cent.

It is quite usual to find the valve stems of T head, L head and overhead valve engines without protection or any pretence made at enclosing them. While, of course, there is no likelihood of dirt and dust having ill-effect where valve stems and springs and tappet heads are exposed, there are obviously advantages to be gained in the way of noise reduction and cleanliness by enclosing these parts. One maker, Parsons, who has exposed valve springs, deposits on them a coating of copper, presumably to protect them from corrosion by sea water and salt laden air.

Crankcases and Cylinders

Cast iron is practically universal for crankcases, aluminum being used on a very few of the lightest engines only, either those for fast sea-going craft or for launches to run on fresh water rivers. Aluminum pistons appear in but two instances, and those are extremes in point of size—the 3 hp. outboard Watermota and the Green aerocum-marine engine ranging from 100 hp. to 450 hp. with six to eighteen cylinders. Strangely enough, too, these makes are the only ones embodying a cylinder construction different from normal, both having copper water-jackets.

Detachable cylinder heads and cylinders cast with the top half of the crankcase are rarely seen, but this fact will have been surmised from the mention of the prevalence of multi-cylinder engines made up with separate and pair cast cylinders. But although the provision of easy access to the combustion chambers is rarely in evidence, there is a general use of large plate-covered openings in the crankcase sides, to allow the connecting rod bearings to be dismantled and the rods and pistons removed without disturbing the cylinders or other parts of the engine. One firm goes so far as to claim that the main journal bearings of the crankshaft can be taken up through the crankcase openings.

In regard to connecting rods, these almost invariably have phosphor bronze bushes in the small ends for a hollow piston pin secured in the piston bosses, and the favorite method of preventing rotational and end movement of the pin is to provide an additional piston ring in a groove in line with its axis. Incidentally, scraper rings are almost non-existent. For the big-ends, a pair of bolts, one on each side, are nearly always considered sufficient, and even in engines of 5 or 6 in. bore, one rarely observes the four bolts which British truck engine makers consider advisable with even smaller cylinder dimensions. And yet inertia forces must be more severe, even at 1000 r.p.m., considering the greater weight of pistons and rods in the usual marine type.

Crankshafts are generally massive and more frequently than not have a bearing between each pair of adjacent throw. It is not at all unusual practice to cast the crankcase in one piece, supporting the shaft at the rear by a detachable end plate which forms the bearing housing, the other journals having detachable caps secured by long bolts passing down from the top of the casting. In such designs there is no removable underpan or sump, access

to the interior of the base being by way of the side openings.

There is a distinct tendency observable to place the fly-wheel at the front end of the crankshaft. This results in a compact arrangement with a unit system of crankcase and reverse gear housing.

The great majority of British marine engines are fitted up or sold to run on kerosene, but the means provided for vaporizing this fuel vary considerably. In a few cases no heating occurs other than that obtained by a hot-air supply taken from a large muff around the exhaust manifold or pipe. Usually, however, there is a more effective provision, consisting of a vaporizing chamber heated by the exhaust gases immediately they find exit from the cylinders. But beyond exhaust heating systems, with many variations in design all having the same or a similar effect, there is nothing startlingly new in the way of kerosene vaporizers. In half a dozen or so makes of heavy duty engines, the heating chamber is designed for the application of a blow-lamp for engine starting. Usually provision to this end consists of a cast-on bracket for the lamp, from which the flame can be directed on to a portion of the exhaust jacket. But in one instance two concentric compartments—for mixture and exhaust respectively—have an open ended central tube up which the flame from a vertical lamp can pass and impinge upon baffles within.

Generally, however, gasoline is depended upon for starting from cold, the same carbureter and float chamber being fed with either fuel by means of a two-way cock where the pipe lines unite. It is exceptional to find two separate and distinct carbureters used, although Aster has this kind of arrangement, the mixture from both leading eventually into the same induction manifold from which the gasoline mixture supply can be cut off by a special valve; the kerosene in this case is vaporized by carrying the outlet pipe from the one carbureter through the full length of the exhaust manifold.

A water drip with kerosene as fuel is also exceptional, though it is provided for in a few instances. But a drip tray beneath the carbureter, whether gasoline or kerosene is to be used, is frequently seen. One or two of these are elaborate fittings of cast iron or aluminum, with fine mesh safety gauze across the top of the tray and a drain pipe through which the overflow fuel can be carried away into a special receptacle instead of leaking into the bilge water.

Distribution gearing consists almost without exception of straight toothed pinions. The silent type of chain is not used and skew gearing only appears for the right angle drive to a transverse shaft when the latter occurs.

The Use of Starters

A centrifugal type of governor acting on the carbureter throttle is quite normal on all except the smallest or lightest type of marine engine; approximately 65 per cent are so equipped. Impulse starters, on the other hand, are standard on only 30 per cent of engines; this, too, despite the fact that heavy engines with crank starting, magneto ignition only, and generous dimensions as to bore and stroke are mostly in question.

In the prevailing medium and slow-speed engines, the piston type of water circulating pump is greatly in favor; it is driven by an eccentric, usually either on the crankshaft or on the camshaft extension, through a coupling rod. It has a stationary (non-oscillating) cylinder cast in phosphor bronze, with non-return valve and piston of the same material; the piston has no rings, leakage being prevented by gland packing at mid-stroke with a two, three or four-bolt exterior flange adjustment.

Occasionally the eccentric serves to actuate other pumps

and, in one instance, the oil, fuel, water and bilge pumps are grouped in a unit casing and actuated from the eccentric. An air bottle, to prevent "hammering" by equalizing discharge pressures, is not infrequently provided, but it is not usual practice to fit one. Approximately 25 per cent of the engines have these piston pumps for water circulation, 50 per cent the gear wheel pattern, 5 per cent pure centrifugal, while 20 per cent have the eccentric type.

Eighty per cent of British marine engines have gear type oil pumps, which are rarely found inside the crankcase. In fact, a submerged pump is quite exceptional; they are generally arranged in front of the distribution casing and driven either from an extension of the camshaft or by roller chain from the end of the crankshaft. Occasionally they are located low down outside the crankcase and driven by skew gearing and a vertical shaft from the camshaft on that side. Oil filtration is generally carefully provided for, not only as regards filter dimensions, but in making it accessible and capable of being removed and cleaned without draining off the contents of the crankcase or sump.

Fifty per cent of the engines have some means of cooling the oil. The usual practice is to carry the water pipe through the crankcase sump in its run from the outboard inlet to the pump; the internal piping is generally straight, but one or two engines have coiled or curved lengths in order to expose a greater cooling area to the oil. One engine has a false bottom to the oil sump, which covers a second sump through which the water passes on its way to the pump.

Brooke engines have oil jackets to the induction manifolds, a double purpose being served, that is, the oil is cooled and vaporization assisted. The British Admiralty insist upon engines for their use having a separate oil cooler and in the largest Brooke model this is retained as standard. It is a concentric cylindrical fitting, through the outer jacket of which passes the intake water, while the oil is drawn or forced through the center.

There is room for improvement in reversing gears, which, speaking generally, give more trouble in use than engines. The most prevalent type is a separate unit embodying a friction clutch for the forward (direct) drive and a system of epicyclic gearing to provide the reverse, with a band brake applying to the outer member.

Reversing Gears

Two recent designs of reversing gear show considerable variations from normal. In one, either the thrust or the pull from the propeller is relied upon to provide the end pressure for one of two cone clutches, one for forward drive and the other to displace the band brake of an epicyclic reverse system. In the second variation, engine torque keeps the friction clutch engaged; for this purpose the drive passes through a cylindrical extension of the driven member in which are helical slots accommodating projections from a concentric inner sleeve bolted to the flanged front end of the propeller shaft. Thus, torque has the effect of imparting end thrust to the clutch as soon as the surface of driving and driven members are brought into contact by the operation of the control levers. The provision of angles of helix and cone that will give a non-slipping drive and yet one that will not jamb calls for some nicety in design and precision in manufacture.

In the Vickers-Elma reversing gear, an epicyclic system with bevel pinions is used, and both the forward and reverse clutches are of the magnetic type. Switch control displaces the operating lever, the switches being moved by a small hand lever which is coupled to the engine throttle and moves the latter toward the closed position before either switch is moved to the "off" or neutral contact.

While it cannot be said that British motor boat engines display any marked development in design since the pre-war period, there is clear evidence of a desire to get down to a smaller range of models of a standardized type. Prior to 1914 many firms of engine builders—for they were "builders" then rather than "manufacturers"—had an almost unlimited range of models, each one having varying characteristics and dimensions of bore and stroke differed without apparent reason. Now there is an endeavor to specialize on a limited number of types, though some firms still offer as many as eighteen or twenty different models.

From the foregoing it will be surmised that quantity production does not exist. Outputs of more than six or eight engines per week are exceptions, and as a result prices generally rule high.

The Semi-Diesel Engine

Engines of small power usually have one or two cylinders. The two-stroke cycle predominates in the lighter types, while the four-stroke is almost universal for the heavier boats and for commercial craft. The latter statement takes no account of the semi-Diesel type of engine and this is hardly as it should be, for quite a number of firms are now making small crude-oil plants, ranging from 5-6 hp. upward, for large pleasure boats, fishing and harbor craft and industrial purposes generally.

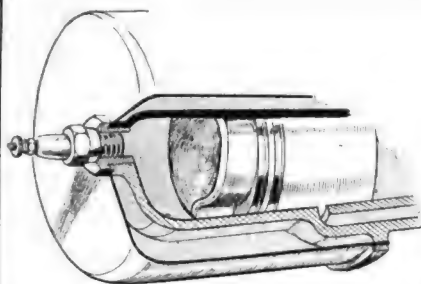
The semi-Diesel engine, with a two-stroke cycle, burning heavy fuels is, in fact, attracting the attention of a great many British marine engine makers and big engineering firms as well. On the one hand we have Brooke, Aster, Joy and Ailsa-Craig, who have hitherto made nothing but light and medium weight gasoline and kerosene engines standardizing single cylinder crude-oil engines of approved designs; while at the other end of the scale are such well-known engineering concerns as Beardmore, Vickers, and others, who have previously touched this side quite half-heartedly, organizing to turn out in quantities a similar type of plant up to 1000 hp., with ability to supply far larger equipments for ocean-going cargo boats by duplicating or triplicating the standardized engines. Other engineering firms, Babcock & Wilcox, for example, are at present still merely agents for Swedish and other European makers of semi-Diesels, but are organizing to build under license in England.

This type of internal combustion engine is, without question, interesting a great many of the old-established marine and general engineering enterprises which hitherto have kept to steam plants, and, although in the larger sizes the Diesel and semi-Diesel engines are beyond the scope of the motor boat engine manufacturer with his existing plant, the small models would seem to represent an outlet for the activities of even automobile factories.

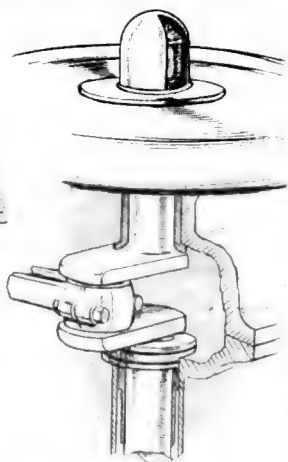
In point of fact, the crudities and excessive weight of the heavy oil engine appear to call for the influence of the automotive engineer. Weight reduction is, at present, considered unnecessary, if not actually undesirable; but when we find engines of less than 100 hp. weighing anything from 10,000 to 20,000 lb., and others of 6-10 hp. weighing 1000 to 1200, it seems time for fresh minds.

As a marine engine for certain large classes of use, the semi-Diesel has pronounced advantages over the heavy kerosene type. Its ability to use a cheaper fuel, its low costs of running and its efficiency at low rates of revolution make it eminently suitable in its smaller sizes for use in a sphere where it is rarely found at present, i.e., in heavy, slow-speed commercial small craft and as an auxiliary for sailing vessels. Although it is certainly coming more widely into use for such purposes, its excessive weight tells against it in a large number of cases. And here, it seems to the writer, the automotive engineer might well apply his experience and methods.

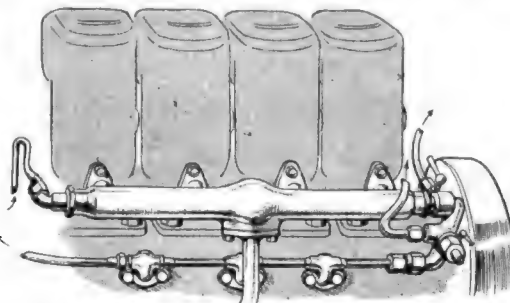
Exhibits Seen at the British Marine Engine Show



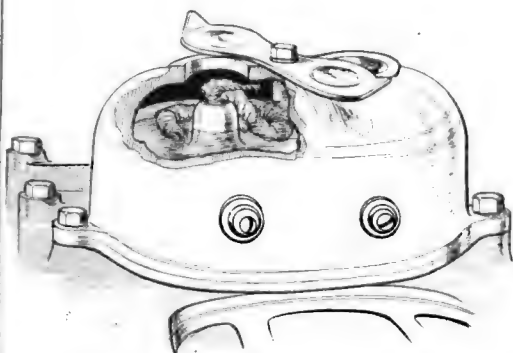
Watermota cylinder construction with copper jacket.



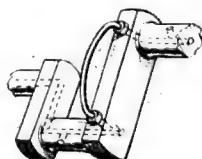
Ball thrust below crank of outboard type engine and oil lubricator above flywheel center.



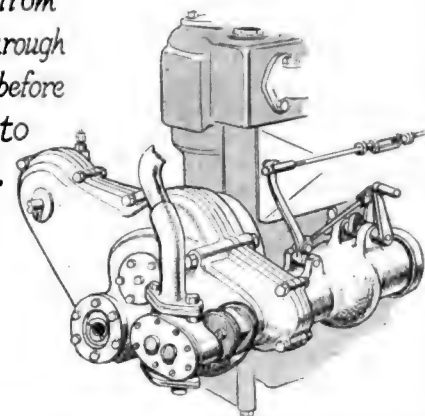
Parsons oil cooling system. Oil pipe from pump passes through water manifold before branching off to bearing leads.



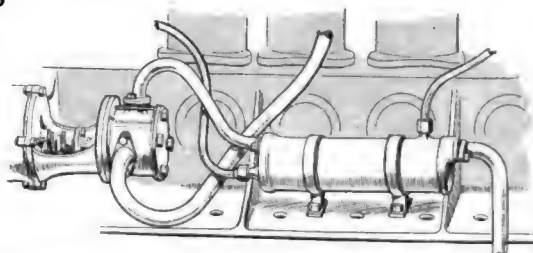
Aluminum cover, oil reservoir and support for valve rocker pins on 4 x 5 1/2 in. Thorneycroft.



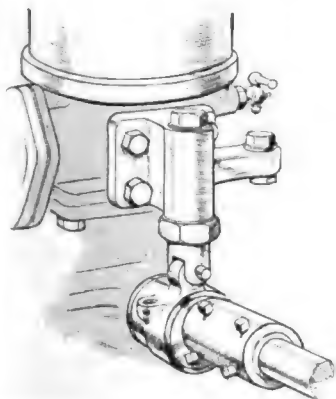
External oil pipes in place of drilled holes occur on two webs of Chapuis Dornier engine crankshaft.



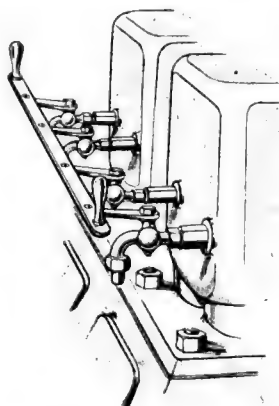
Tyfe Wilson light car engine, thermo-syphon cooling fitted with water pump and centrifugal type governor for river launch work.



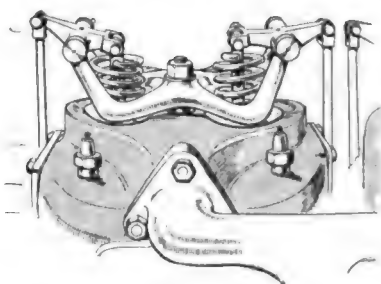
Water jacketed oil cooler on Brooke engine.



Eccentric water pump drive on rear end of crankshaft of Watermota inboard engine.



Coupled half-compression cocks at mid stroke on cylinders of Atlantic engine.



Double yoke holding inlet valve cages and supporting valve rockers on 70 h.p. Thorneycroft. Valve springs are hook-ended to pass through slots in valves.

Development of the Drag Link Results in Many Improvements

Although one of the important parts of the automotive vehicle, the drag link had little development until the past year. However, much was done with it in that time and much progress has been made in its design.

By V. A. Davisson*

DRAG links, like other parts of automotive vehicles, have been greatly improved during the past year. Although it has been recognized that the drag link is one of the most important parts, little attention has been given it until recently.

The first links were made by brazing the sockets to the connecting tube. These sockets (Fig. 1) caused considerable trouble, due to the fact that, after being in service a short time, the end plugs would strip and blow out, often causing an accident. To eliminate this a spring was placed in the socket to absorb vibration. Stripping of plugs stopped and the first step in drag link improvement had been accomplished.

Brazing is an expensive process and, with the advent of electric welding, one progressive company began a series of experiments, which resulted in a successfully welded link (Fig. 2). Engineers were at first skeptical and considerable missionary work was necessary before they could be convinced that a weld was as dependable as a brazed joint.

After the electrically welded link, the cap socket was developed for the heavier cars, as it was felt that the lightweight socket would not stand up. This style of socket, as shown in Fig. 3, was so successful that it has not been changed and is now used on many of the heavy cars as well as a number of trucks. The greatest advantage of the cap socket is that the ball cannot jump out of socket in case of spring or plug failure. Cap is held by a taper pin to prevent hammering of the threads.

From the development of the cap socket until 1919, no developments in drag link design or construction were made. It seems strange that while engine and chassis design as a whole was making rapid strides, this particular part of the steering mechanism received no attention. During the year 1919, however, the drag link has been developed more than in the many years preceding. Following are the improvements:

The grease self-lubricating link (Fig. 4).

The oil self-lubricating link (Fig. 5).

The end grease cup (Fig. 6).

Interchangeable parts:

The one-piece weldless link (Fig. 7).

The three-piece weldless link (Fig. 8).

The one-piece tractor link (Fig. 9).

*Associate member A. S. M. E. and S. A. E.

The self-lubricating link, as used on the Class B military and the heavy duty aviation trucks, as shown in Fig. 4, indicates only a slight change from the previous design. The ball seats toward the tube had a hole in them. When assembling, the tube and socket are filled with grease. During operation the play of the spring draws the grease from the tube and keeps the working surfaces well lubricated. In some cases the grease is replenished through a tapped hole in the tube or the bore of the socket. It has been found, however, that with the tube filled with lubricant when assembled, the working surfaces will be kept supplied for at least a year.

With the attention which has been given the question of oil lubrication, the drag link lubricating system was materially improved. As shown in Fig. 5, the ends of the connecting tube are closed by plugs through which a wick passes. The wick draws the lubricant directly to the working surfaces. By using one long piece of wicking, both sockets are oiled, even if the link is mounted in an inclined position and the oil is low.

The end grease cup, Fig. 6, delivers grease directly to the wearing surfaces. The grease storage space is larger than in the usual type of grease cup, which is screwed on the side of the link.

The dealer, as well as the manufacturer, is interested in reducing the number of service parts

to be carried in stock. This end has been furthered by making the plugs and seats in both ends of a link interchangeable. This can readily be seen by comparing Figs. 2 and 7.

While the brazed and the welded links have given excellent service, a great deal of experimentation has been devoted to the development of a link which would eliminate the joint. Thus some links have the sockets screwed to the tubing, while some are screwed, pinned and brazed. Last year, however, there was developed a link made of a single piece of tubing (Fig. 7). The small connecting tube is expanded at the ends in such a manner that the cross-section of material is the same at all points. This is considered the greatest improvement in drag link construction as all parts of the link are of equal strength.

Fig. 8 shows a drag link adapted to light vehicles. The connecting rod is upset into the sockets at the end to eliminate the weld. The sockets, while held in place by spring pressure, are free to revolve slightly. This takes

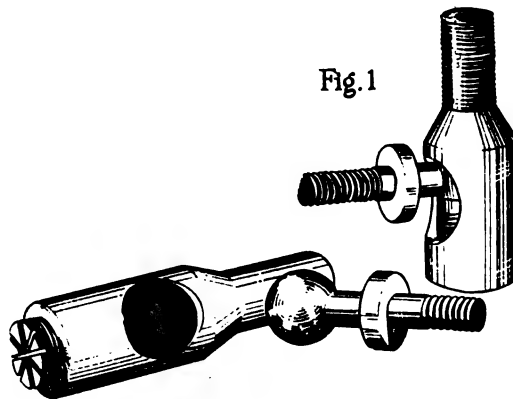


Fig. 1—An early type of link

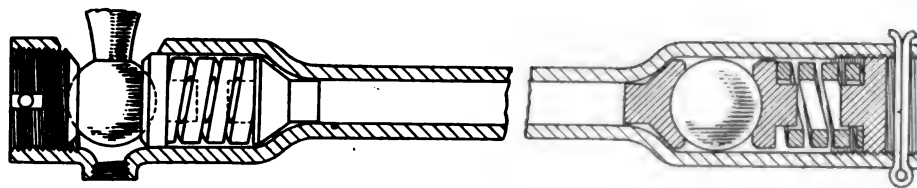


Fig. 2

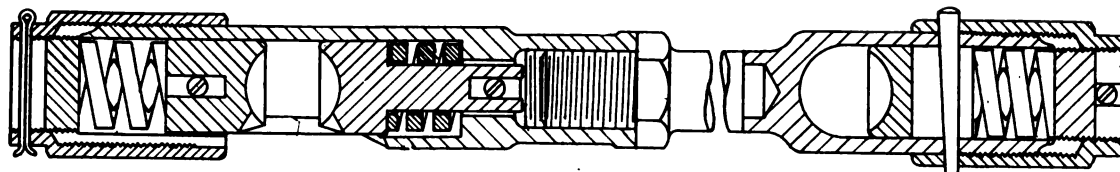


Fig. 3

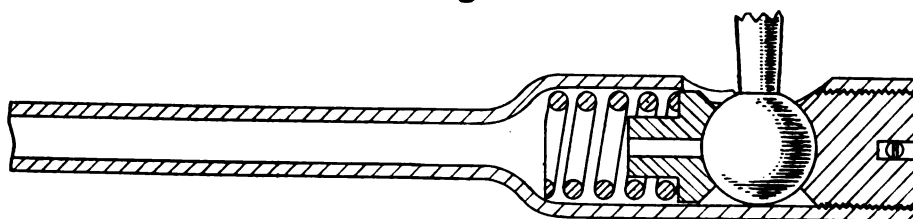


Fig. 4

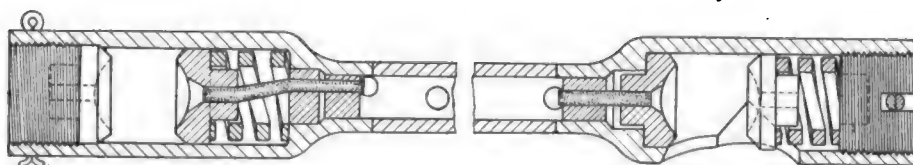


Fig. 5

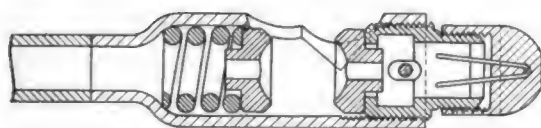


Fig. 6

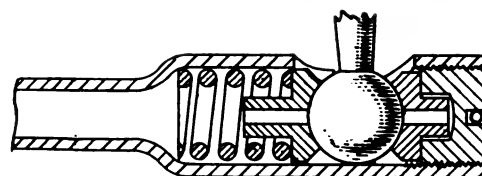


Fig. 7

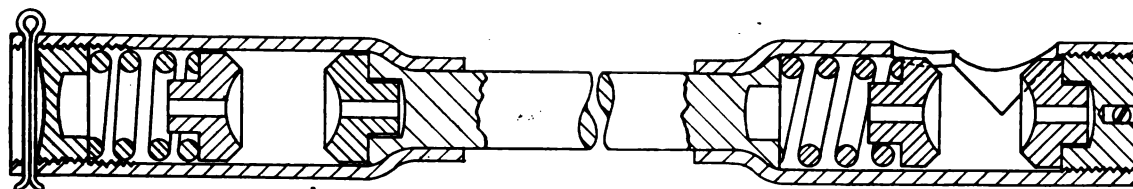


Fig. 8

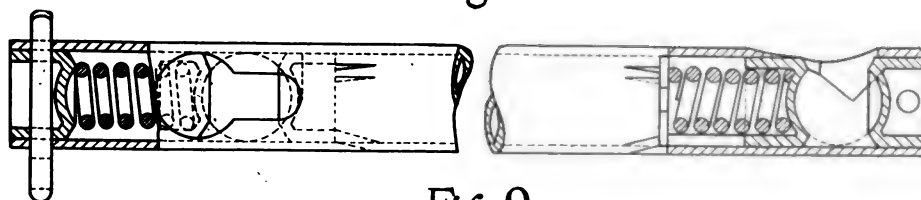


Fig. 9

Fig. 2—Welded link
Fig. 3—Capped link

Fig. 4—Grease lubricating link
Fig. 5—Oil lubricating link

Fig. 6—With end grease cup
Fig. 7—One-piece weldless

Fig. 8—Three-piece weldless
Fig. 9—One-piece tractor

care of the side motion of the steering arms which often injures the sides of the sockets.

Tractor manufacturers, in refining their designs to conform with automotive standards, are adopting the drag link type of steering. For this service a heavy yet inexpensive style of link, as shown in Fig. 9, has been used. While not as convenient as the standard style of drag link, the service rendered is the same.

In looking back over drag link development, it seems that the greatest progress has been made in the past year.

This is true and from all indications we may expect few changes during the next few years. The break in production caused by the war gave car builders a chance to stop and perfect what had been considered an unimportant unit. The drag link came into its own for a time, for on its action the safety of the vehicle and its occupants depends.

However, with the return to large scale production it is probable that development on small parts will give way to intensive work on larger units.

Making the Square Hole Drilling Process Commercially Practical

A DEVICE that will drill a square hole in one operation in metal or other substances, without subsequent finishing and without previous preparation, is known as the "Radbore head." It is a drill based on the well-known principle of the Cardan circles and can be easily and rapidly attached to any milling machine or drill press. This is one of the multitude of products distributed by the Fairbanks Co., and is intended to provide a means for making square holes in gears or wherever square drilling can be advanced.

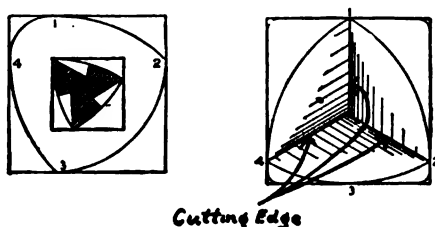


Fig. 1—Sections of square hole drill

tageously employed. The illustrations will make clear the features of the design and mode of operation.

In Fig. 1 the small numerals 1, 2, 3 and 4 indicate a cross-section of the shank of a drill that is rotated within a square guide, represented by the outer lines. The small square at the center represents the hole that is being drilled and the shaded portion is a cross-section of the cutting-edges. A clear idea of the motions of the drill may be had by tracing on thin paper an outline of the shank and cutting-edges in the left of the figure, and then turning the tracing around in such a way that the contour of the shank remains within the outer square or guide. If this is done, the cutting-edges or end of the drill will be seen to follow the outline of the square hole.

With cutting-edges ground as shown at the left of Fig. 1, the corners of the drilled hole will be slightly rounded or filleted. To make a hole having sharp corners, a shank as indicated at the right of Fig. 1 is used, with one cutting-edge longer than the others, in order to reach into the corners and square them. In both types, the cutters are so designed that there are no chips left at the bottom of the hole and no rough edges, so that blind holes can be drilled in one operation, without the necessity of subsequent finishing. The success of the operation depends upon the exactness with which the shank of the drill follows the square outline of the guide, and the dependability of the attachment rests upon its design in accordance with this principle.

The two styles of drills are known as type A and type B, the former making a hole with corners rounded, equal amounts of material being left in each of the four corners. This assures an equal distribution of the stresses

in case the drilling is for the purpose of inserting a drive-shaft. The type B drill is designed for die work, the squaring of the ends of keyways and similar operations. The type B drill is useful for the quick completion of sundry jobs, while the type A has the greater commercial value on production work in the factory.

"Radbore heads" or chucks are manufactured in four sizes and two styles, the range of the drills, $\frac{1}{8}$ to 2 in., being as nearly equally divided between the four chucks as possible. Type A drills are made from $\frac{1}{8}$ in. to 2 in., by sixteenths, and the type B by sixteenths, from $\frac{3}{8}$ in. to $1\frac{1}{4}$ in. As these drills are free cutting tools, with plenty of chip clearance, heavy pressure on the feed is not needed, and work is said to be done equally well in aluminum, cast iron and steel.

It is said that the British Government motor transport depot at Slough is turning out motor cars and trucks at the rate of 175 per week, while 200 motorcycles are put on the road in the same time.

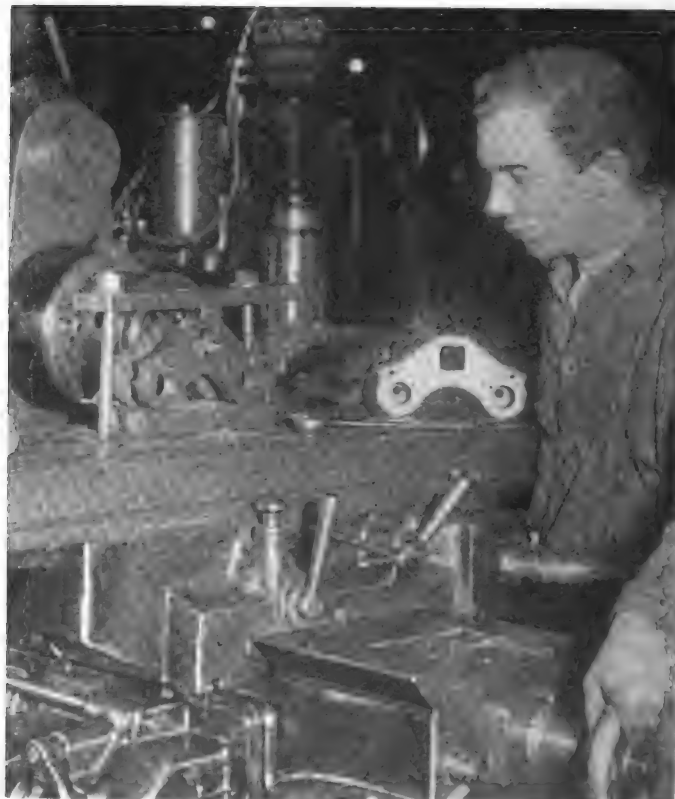


Fig. 2—The square hole drill in operation

Plywood Body for Five-Passenger Sedan Weighs 120 Lb.

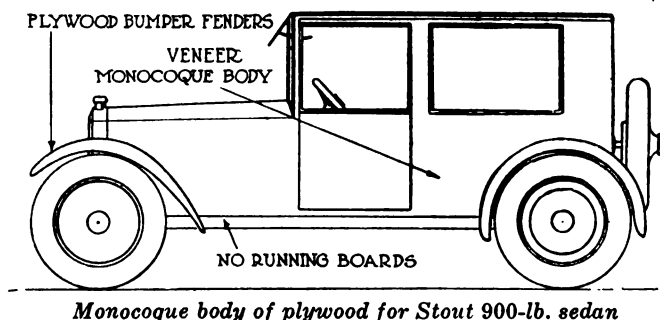
The extremely light car has long been a mooted point in the field of automotive design. Plywood, as developed out of airplane practice, has been considered as the body basis for such a machine. The article herewith tells of experiments with sedan and bus types.

EXPERIMENTAL plywood bodies are being constructed at the Stout Engineering Laboratories. At the present time, there is under development a special five-passenger sedan body which, it is claimed, will weigh only 120 lb. for a 112 in. wheelbase car. This is about one-third of the weight of an aluminum body of the same cubic capacity. There has just been shipped to one of the well known eastern manufacturers a five-passenger sedan body weighing 196 lb. This car, which is known for its lightness, has hitherto used an aluminum body weighing 600 lb. These bodies are constructed on airplane fuselage principles and are of a three-ply veneer combination, designed for unusual strength.

The characteristics of plywood have been discussed frequently in these columns and these allow the plywood to act as a sheathing and at the same time to add to the strength of the structure. The combination of veneers most commonly used consists of two plies of birch with a ply of mahogany between. The thickness averages about $\frac{1}{8}$ in., although some of this material as used on airplane work is as thin as $\frac{1}{32}$ in.

Designs are now being laid out for a two-deck automobile bus body enclosed both above and below. This body when completed, will weigh less than the present open types of bodies, according to the claims of the designers. Engineers who attended the last summer meeting of the Society of Automotive Engineers at Ottawa Beach will remember a rather interesting discussion on a 900 lb. five-passenger car. It is stated that a five-passenger sedan, to

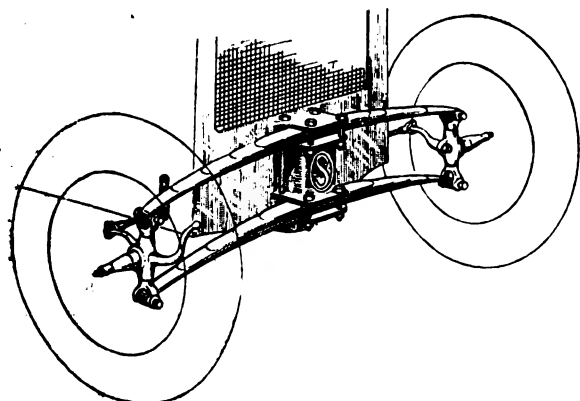
meet this weight, is under development at the Stout laboratories. It closely follows airplane fuselage practice, the particular construction being along the lines of the German Albatross. In that, the sills and frame are combined and the axles are replaced by cross-springs, which fulfill the functions of both springs and axle. The drive to the rear is through propeller shafts with universal joints. Plywood is used practically exclusively in the construction of the car, even the fenders being of this material. The cross-spring suspension is of particular interest, and is illustrated herewith.



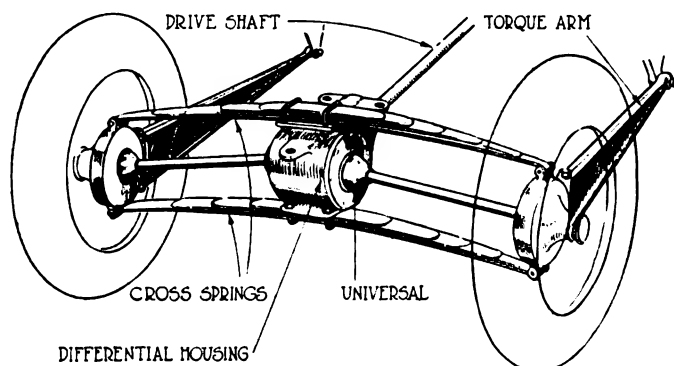
Monocoque body of plywood for Stout 900-lb. sedan

An Indian Source of Fuel Alcohol

IN the current number of "The Bulletin of the Imperial Institute," the possibility is discussed of utilizing the mowra flowers of India for the purpose of manufacturing alcohol for use as motor spirit. These flowers possess thick, juicy petals, rich in sugar. They are used by the natives as a foodstuff and especially for the preparation by fermentation of an alcoholic liquor called daru or mahwa spirit. A single tree will yield as much as 200-300 lb. of flowers in a year. About 90 gal. of 95 per cent alcohol are obtainable from one ton of the flowers. It has been estimated that in the Hyderabad State alone there are already sufficient mowra trees for the production of 700,000 gal. of proof spirit per annum. in addition to that necessary for the local liquor requirements.



Stout spring axle construction. This was used on a car manufactured by Mr. Stout in 1914



Sketch of spring rear axle construction for Stout light weight car

Tests of Lubricants for the Internal Combustion Engine

The detection of adulterants or other impurities in oils and the determination of their value should be of wide interest throughout the automotive field. In this, Mr. Ziesenheim describes various methods of tests.

By Fred C. Ziesenheim*

COMPLETE tests of a lubricating oil for use in internal-combustion engines will comprise laboratory tests of the oil's chemical and physical properties, special tests in an engine and extended operating tests with the engine performing its regular work.

Chemical tests are performed for detecting adulteration or lack of proper refining processes. Adulterants may be fixed oils of animal or vegetable origin, sulphonated oils, resins, or thickeners such as soaps or aluminum oleate. If the refining processes are poorly conducted, free sulphuric acid, free carbon, and tarry or asphaltic constituents may be present in the oil.

Acidity.—The oil must be neutral in acid and alkali reaction and must contain no naphthenic acids.

Emulsification and Moisture.—During the oil refining processes, oil is treated with sulphuric acid which is later washed out with water. An emulsification indicates the presence of free acids or sulpho compounds and is also an index as to the oil's chemical stability or resistance to heat decomposition. The effect of free acids upon bearings, exhaust valves and seats, is to cause rapid pitting and rusting, and consequent power losses. Oil must readily separate from water and not emulsify, as there is usually water present in the engine's lubricating system.

If a sample of oil with an equal quantity of water is heated to 180 deg. F., then vigorously shaken for five minutes and allowed to settle for one hour, the oil should show rapid separation from the water and the water should be only slightly turbid. Oils that permanently emulsify with water, rapidly decompose in service and those showing a poor emulsification test always suffer an undesirable decomposition when exposed to heat.

The oil should show no trace of moisture content. If a sample of oil, upon being heated gently, acts bumpy or froths, it is evident that water is present.

Insoluble Matter.—The presence of insoluble matter can be detected by making solutions of the oil in high grade solvents and then noting the precipitation after twelve hours. Matter insoluble in petroleum ether is hard asphalt. Matter insoluble in ether alcohol or high grade gasoline is soft asphalt, dirt and tarry constituents.

Physical Tests.—The physical tests are performed to determine the physical characteristics of the oil with the view of ascertaining the desirability of the oil for the particular purpose.

Color.—The color of an oil, although having nothing to do with its lubricating value, can be used to identify

a sample. The color and appearance may indicate whether the oil is a compound with heavy cylinder stocks or is a straight run engine oil. The cleaner oil will usually deposit less carbon in the combustion chamber.

Odor.—The odor is negligible unless strongly repugnant, when the oil should be examined carefully for chemical adulterants and reactions, foreign materials from the barrels, and the like.

Gravity.—The Baumé gravity (Be¹) is obtained by immersing in the oil a hydrometer which has an arbitrary scale of values referred to the standard temperature of 60 deg. F. The specific gravity may be obtained from the relation—

$$\text{Specific Gravity} = \frac{140}{130 + \text{Be}^1 \text{ Gravity.}}$$

Gravity is no criterion of the lubricating value of an oil, but merely indicates the source of the crude—whether the oil is from a paraffine or an asphaltum base. An asphaltum base oil from Texas crude having a gravity of 20 Be¹, will have the same body and general lubricating properties as a paraffine base oil from Pennsylvania crude with a gravity of 30 Be¹.

Pour or Cold Test.—The cold test is the lowest temperature at which an oil will flow or pour. It has no reference to the oil's lubricating value except in relation to its desirability for low temperature conditions. Low or zero cold test oils are usually from asphaltum base oils and will remain fluid at zero deg. F., whereas a paraffine base oil of similar lubricating properties will not pour below 40 deg. F. above zero.

Flash.—The flash is that temperature at which an oil, upon being heated, emits sufficient vapor to cause a flash with the application of a small flame. The flash point is important only in that it indicates the volatility of the oil and the possible presence of kerosene and naphtha fractions with accompanying fire risks. Refined oils with the same lubricating characteristics but made from crude from different sources, have slightly different flash points. Considerable importance was formerly attached to the flash point of an oil for use in internal combustion engines, but flash is now considered secondary to the oil's ability to maintain the proper seal between the piston and cylinder wall, and the nature and extent of the carbon formation.

The oil film in the combustion chamber is in contact with the cylinder wall and is also exposed to the heat of the burning charge. The cylinder wall on its water jacket side, cannot be at a higher temperature than 212 deg. F., or boiling of the water would occur. The difference in temperature between the water jacket side and

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the combustion chamber side of the cylinder wall, will not be more than 30 to 50 deg. F., dependent upon the wall thickness and heat conductivity of the metal. The temperature of the oil film in contact with the cylinder wall, will therefore not exceed 250 to 300 deg. F. The maximum temperature of the burning charge will be about 2700 deg. F. for the explosive type and 2100 for the burning type of engine, but the burning type's high temperature is sustained over a longer period of time. The lowest temperature of the cylinder charge will be that of the intake air, which may approximate room temperature. The layer of oil on the metal is protected from the heat of the combustion by the low heat conductivity of the oil from its flame layer to its wall layer. The wall layer is also prevented from attaining high temperatures by the low temperature of the cylinder wall and the rapid heat conductivity of the metal. The oil is exposed to the high combustion temperatures only a short time before new oil is supplied by the wiping of the piston. It is evident, then, that it is unnecessary for the flash point of the oil to approximate the maximum temperature of the combustion chamber, but that a flash point of 300 deg. F. will be satisfactory for many classes of service.

Fire.—The fire point is the lowest temperature at which an oil, upon being heated, will emit sufficient vapor to support continuous combustion, with the application of a small flame. The fire point is usually from 35 to 65 deg. F. higher than the flash point, and indicates the lowest temperature at which continuous burning will take place.

Viscosity.—The viscosity of lubricating oil is one of the most important characteristics to be considered. The object of a lubricant is to prevent metal to metal contact of two sliding surfaces, with the minimum of internal friction within the lubricant itself. That characteristic of a lubricant which tends to keep the metal surfaces apart and to maintain a film, is considered body, and this body is indicated by the relative fluidity of the oil and is termed viscosity.

The viscosity of an oil is inversely proportional to its fluidity and is a measure of its internal friction and resistance to flow, and is a direct indication of the friction which will be developed in the bearing. The viscosity is determined by the measurement of the time taken by a certain quantity of oil to flow through a standard orifice at a certain temperature, and is expressed as seconds at a given temperature. The most commonly used instrument is the Saybolt Universal viscosimeter.

The viscosity of the oils should be known for the range of temperature to be encountered in service to insure the

selection of an oil of the correct viscosity at the working temperature. Viscosity decreases rapidly with increased temperature, but this variation is different for oils from different crudes.

For use in internal combustion engines, the oil's viscosity should be known at 100, 130, 212, and 300 deg. F. Engineers are becoming more insistent on knowing the viscosities of their oils at the maximum temperatures to be encountered.

Carbon.—The total carbon residue left in a crucible from the continued heating and vaporization of an oil sample in accordance with the Conradson method should not exceed 1.5 per cent for practically all classes of internal combustion engine lubrication. The carbon should be loose, flaky, and easily removed from the crucible. The appearance and quantity of the carbon residue are a direct indication of the nature and extent of the carbon that will be deposited in the combustion chamber.

Ash.—If a sample of oil is burned in a platinum crucible, there should be no ash residue remaining after combustion.

Volatility.—Correct volatility is important if satisfactory economy and lubricating efficiency are to be obtained. The degree of volatility must be entirely determined by the maximum and mean temperatures to be encountered, and by the character of the load, whether constant or variable.

Heavy duty engine oils should contain the minimum quantity of

low boiling point constituents consistent with low carbonization.

Evaporation.—The evaporation at a constant temperature over a considerable period of time, or a vacuum distillation, will indicate the evaporation loss that may be expected from the oil in service. Light motor oils will suffer an evaporation loss of as much as 15 to 25 per cent if heated at 300 deg. for 24 hr.

Oxidation.—The stability of an oil, its resistance to heat decomposition, is important not only because oil is exposed to high temperatures in the combustion chamber, but because the oil is being constantly splashed and thrown against the heated piston head. The degree of decomposition that occurs depends on the temperatures involved and upon the heat resisting properties of the oil, or its resistance to chemical decomposition into lighter hydrocarbons and nonlubricating portions consisting of solid or semi-solid hydrocarbons.

A laboratory duplication of engine conditions for ascertaining an oil's stability and its evaporation loss, is an oxidation oven. In an oxidation test, the oil sample is

ENGINE TYPE MFR'S NO. RATED H.P.		CARBON CHART						TEST NO. DATE OIL MFR	
INTAKE ON THIS SIDE EXHAUST ON THIS SIDE SPARK PLUG HERE KEY BLACK - CARBON BROWN - SOOT RED - PASTY YELLOW - OIL		PISTONS						REMARKS OBSERVERS _____ _____ _____	
		INTAKE VALVES							
		EXHAUST VALVES							
		CYLINDER HEADS							

Oil tests of internal combustion engines

kept at a uniform high temperature for a fixed period of time, the surface of the oil being swept by a continuous current of heated air. The ensuing evaporation may result from the loss of naturally volatile constituents, or from the cracking or fractionization of the oil by decomposition into volatile products and very heavy liquids or solid residues not soluble in petroleum ether. The most desirable oils are those having the correct volatility at the working temperature and those giving the least deposits of petroleum ether insolubles.

The viscosity, cold test, volatility, susceptibility to oxidation and emulsifying properties, are the most important tests from the engine lubrication standpoint.

Special Runs.—Engine tests of lubricants may consist of test runs for stated periods of time on a particular engine or engines, or may be extended operating runs with the engine delivering power for its intended work.

If comparative oil tests are to be performed on the same engine or similar engines, it is imperative that the conditions be as nearly identical as possible in the several runs. The initial condition of the engine should be the same in each run, the combustion chambers clean, valves tight with standard tappet clearances and timing, pistons and rings in first class condition, all engine bearings properly adjusted, and all the various engine parts in good condition and functioning properly. In assembling the engine preparatory to the test, the parts should be lubricated with the oil which is to be tested. The operating conditions of the test runs should be as nearly identical as possible with regard to temperatures of the ingoing water and air, manner of supplying the fuel and oil, manner of obtaining the test readings, and with the engine delivering its full or rated load. The fuel should be from the same source for all runs. If possible, sufficient fuel for the entire series of runs should be purchased and stored in the supply tank before commencing the tests. The sample of oil for the laboratory tests should be obtained from the oil supply tank just before the start of each run.

In conducting the tests, readings should be taken of time, revolutions, and torque for computing the horsepower, fuel and oil consumption, temperature of the cooling water in and out, temperature and barometric pressure of the air, control settings, etc.

Horsepower Computations.—The horsepower values may be referred to standard conditions of 760 millimeters barometric pressure and 15 deg. C. temperature, by a correction factor. Humidity is not considered.

Where—

Horsepower corrected = Horsepower reading \times C.

C = Correction factor

$$C = \frac{29.92}{H} \times \frac{459 + T}{459 + 59}$$

H = Barometric pressure, inches of mercury.

T = Air temperature, deg. F.

Function of a Lubricant.—One of the most important functions of an oil for internal combustion engines, is to maintain a seal between the piston and cylinder wall and prevent the fuel and products of combustion from escaping past the piston into the crankcase. Deterioration of the oil in use results primarily from the ineffectiveness of the piston seal and only to a small extent from the decomposition of the oil itself. If the oil is too light in body and is blown out by the combustion products, the piston will be burned by the escaping gases, and scoring of the piston and cylinder wall will result. If the oil

allows portions of the fuel or combustion products to leak past the piston into the crankcase, it will result in contamination of the oil supply, with lowering of its gravity, flash, fire, and viscosity tests.

For comparisons of the used with the original oil, samples should be taken from the lubricating system at regular intervals during the run, as every half hour of a five hour test.

For some classes of engines, particularly large stationary or marine engines, the bearing temperatures are important. It is often possible to place thermometers on the main bearings and note the temperatures during the run, but upon completion of the test run, thermometers should be placed on all the bearings and other places where temperatures are considered important and readings taken rapidly until temperatures have reached the maximum and gone down again. The thermometers can be applied with putty, friction tape, packed with cotton waste, etc. The maximum bearing temperature for babbitt bearings in stationary practice is 160 deg. F.

In stopping the engine upon completion of the test, note whether it stops freely or labors and stops suddenly, whether preignition causes further running, and whether the engine appears to be hotter than usual, or normal.

Data Taken Upon Completion of Test Runs.—The examination of the engine upon completion of the test can be recorded as a written description and by photographs and charts. The thickness of the oil film on the cylinder walls can be measured by means of cigarette papers. Place a formed weight of one pound on a pack of Riz La Croix papers for five minutes and note the number of papers stained by the oil. Each paper is about 0.001 inch thick.

The extent of the carbon formation by weight, can be determined by weighing the parts when covered with carbon and when clean; the difference will be the carbon weight. An analysis of the carbon is often made to assist in determining its source, as in automobile engines for instance, an analysis will show that a large portion of the carbon formation is road dust or silica.

Final Condition Data.—For the final examination of its condition, the engine must be dismantled and the various parts examined in detail as outlined below:

Wearing Parts	Parts	Sooty
Oil Film	Cylinder bores	Granular
Sufficient	Pistons	Smooth
Insufficient	Piston rings	Clean
Odor	Piston pins	Extent
Color	Bearings	Weight
Sediment	Journals	Location
Grit	Valves	Charts
Body	Valve gear	Photographs
	Cams	Heat Indication
Wear	Gears	Normal
Normal	Auxiliaries	Abnormal
Abnormal		(red—preignition)
Free	Combustion Parts	Parts
Sticky	Carbon Formation	Cylinders
Smooth	Nature	Pistons
Scored	Hard	Valves
Heat Indication	Soft	Spark plugs
Normal	Brittle	Auxiliaries
Abnormal	Pasty	

Operating Runs.—Tests of lubricants on regular operating runs, with the engine delivering its power for its intended work, should follow the procedure given for the special comparative runs as closely as conditions permit.

That oil which satisfactorily and most economically lubricates the engine and leaves a minimum of carbonization products in the combustion chamber and which maintains its original condition for the longest time, is the oil best suited for the given conditions under which the tests have been run.

Economy in the Manufacture of Crankshafts

Specially designed lathes are recommended here as being the proper equipment for plants making more than twenty-five shafts daily. Two types of such machines are described here, with the operations of manufacture explained in detail, for capacities ranging to 100 daily.

CRANKSHAFTS for automotive engines, when manufactured in quantities of 25 or more per day, should be made on specially designed lathes. Manufacture on the ordinary type of engine lathe in quantities above this generally works out to be poor economy, unless some special adaptations have been employed. With the increase in shaft diameters and with the closer limits of accuracy now in vogue, the special crankshaft lathe becomes even more of a necessity. Wickes Bros. have specialized on lathes for crankshaft manufacture and are producing two types, the Duplex, which is generally used for a production of 100 or more shafts per day, and the Universal, which has a capacity of from 50 to 80 six-throw shafts per day.

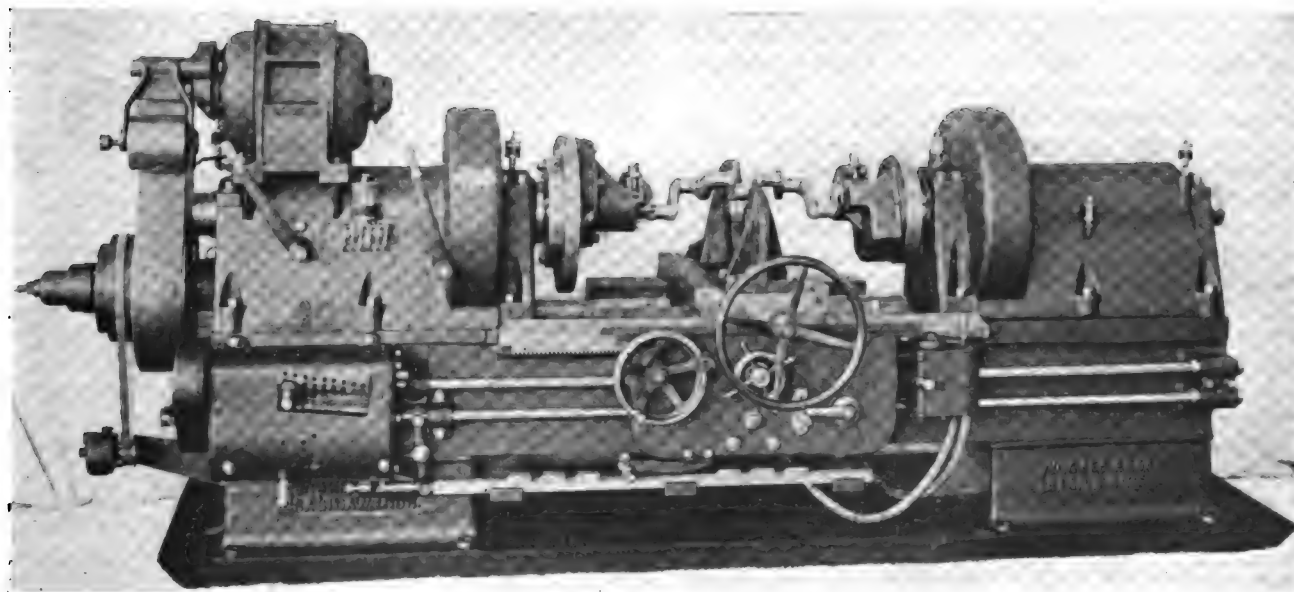
The Duplex is designed particularly for crankshafts with four or more throws and a separate machine is usually furnished for each pair of pins. For instance, on a six-throw crank, one crankshaft lathe would machine pins Nos. 1 and 6, another would machine Nos. 2 and 5, and a third would machine Nos. 3 and 4 pins, simultaneously. The usual practice is to deliver the cranks to the pin lathe, with the flange, front and rear journal and center bearing rough turned.

Cast steel pot chucks, mounted on the flanged end of the spindles of both headstocks, are used to clamp the crank in position for turning; the two front tools on the cross slide are then brought into action for turning the center portion of the pin. After this short operation is com-

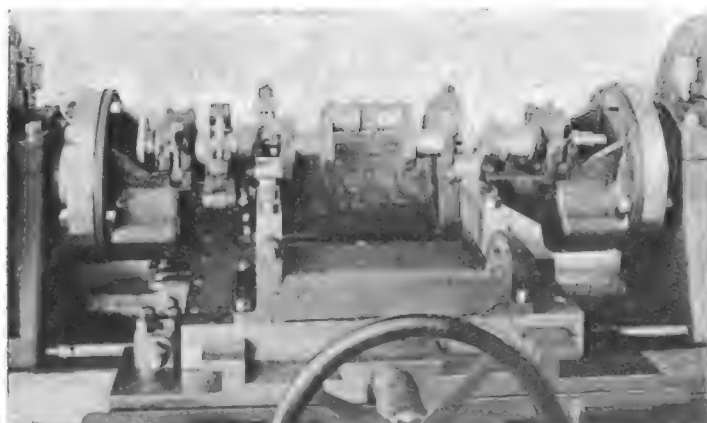
pleted, the rear tools for turning the end portions of the pin and filleting are brought into action by a patented electric rapid cross-traverse mechanism. These two operations are completed in less than a minute, as the machining is done semi-automatically, the weight of the crank and its size, as handled by the operator, seems to be the basis of production rather than the actual machining time.

The initial drive, either direct from motor or countershaft, is by belt through a driving pulley. The drive is carried from the driving pulley through a friction clutch that is engaged or disengaged by the movement of one lever. Throwing the clutch out automatically engages a wide face band brake of automobile design and stops the spindle at a point most desirable to the operator for the removal of the finished shaft and the insertion of a rough shaft, ready to be machined. Two speed changes are obtained within the headstock by means of shifting gears, operated by one shifting lever.

Both the front and rear headstocks are driven together by a heavy nickel steel shaft running through the center of the bed to a large diameter, wide face, herringbone gears. The herringbone pinion, driving the face gear on the rear headstock, is adjustable on the driving shaft, for the purpose of alignment of pot chucks and taking up any lag which might accrue after long and hard service of the machine. The main spindles are made of high carbon crucible steel forgings with heavy, large diameter flanges for supporting the pot chucks or face plates, as the case



Wickes crankshaft turning lathe, showing horizontal turning tool in front with filleting tools in rear



Showing operations on pins 2 and 5 of six-throw crankshaft



Showing vertical wide nose tools in front for turning and filleting tools in rear for working on pins 3 and 4

may require. The position of the rear headstock on the bed can be changed to accommodate different lengths of shafts.

The lathe bed is heavy, with wide flanges, front and rear, having an extremely large section V in front for guiding the carriage and a standard V on the rear of the bed for alignment of the headstocks. Particularly wide surfaces are provided for gibbing the carriage, both front and rear, this being an essential feature in connection with crankshaft work wherein the front tools take a direct pressure downward and the rear tools a pull upward. This must be cared for by the strength of the bed proper.

The tool equipment consists of a set of Universal tool holders, mounted on heavy slides. The holders are arranged to receive and are provided with a set of two tool bit holders in front and two tool bit holders in the rear. The bits are used in these holders on the front of the lathe and are furnished with standard width tool bits, so that the operator may feed this tool across the face of the pin, or they are provided with wide nose vertical tools for taking practically the full width of the pin at one cut.

The filleting tools in the rear (four in number, two on each holder) are the same for the standard tool as for the wide nose tool.

The Universal type is best suited to a nominal production of four- or six-throw cranks, or in cases where the customer is manufacturing a varied product for other concerns, for the reason that, while its production is not up to the Duplex lathe in quantity, it has the advantage in elasticity, to the extent of taking in any length of shaft permissible with the length of the bed furnished and of varied strokes from 1 in. to 3½ in. throw, or 7 in. stroke, and practically diameter and face of pin. The pot chucks furnished are adjustable for different throws and movable radially for different indexing of pins, the idea being that the crank is mounted in the two pot chucks and on the six-throw crank. Pins Nos. 1 and 6 are finished first, the machine is then stopped and indexed over to Nos. 2 and 5. These pins are machined, then the machine is re-indexed to Nos. 3 and 4 pins and these pins are completed. In this way one machine completes an entire shaft in connection with the pin turning and filleting operations.

The Larger Airplane

COMING developments of the airplane will revolve around the triple factors of increased size and carrying capacity, greater speed and higher altitude range, in the opinion of Gianni Caproni, the Italian aviation engineer and constructor, who has made a short trip to the United States for the purpose of studying conditions in this country. Signor Caproni believes that the limits of size for airships have not been approached and that, as it has been with naval building, the coming years will see planes of greater and greater capacity.

While in New York he announced that he has started construction of a plane designed to carry 100 passengers. It has a wing spread of no more than 100 ft. but is equipped with eight 12-cylinder Liberty engines. Under present conditions, he plans it for low altitude cruising; later, however, he hopes to re-power the big ship in such a manner that it may operate at higher levels and with resultant higher speed. The 100-passenger plane, he said, was only a further development of a new Caproni triplane, photographs of which were recently received here, having a double-deck fuselage, seating 40 persons.

The enlargement of engine power, which the Italian designer predicted, will carry with it the development of super-charger mechanisms so that the ceiling may be

pushed farther and farther upward. That phase he sees as one of the most forward efforts of aviation engineering. The higher levels will make possible greater speed, or lower engine consumption, and, naturally, enhance the safety of flight.

The future course of Italy, as regards aviation matters, will be that of increasing her air fleets in connection with the army and navy. The present military view in Italy is that another war would bring its first shock of combat in the air, rather than on the ground or on the seas. Consequently, Caproni stated that Italy would rely upon her aerial fighters rather than her fleet or her army and that this would necessitate a continued aviation section of large size. No governmental appropriations of unusual size have yet been made for the maintenance or creation of such a peace-time fleet, but the Italian said that his country might be expected to develop such a program within one or two years.

GERMANY continues to buy copper in the New York market, according to the *Wall Street Journal*. These purchases are of healthy proportions, and copper sellers deduce therefrom that future buying orders will cover large lots.

Selling the Farmer on the Use of Motor Trucks

The agricultural communities of the Middle West have gone through a land boom that has sky-rocketed values to unknown heights, necessitating enlarged and heavier production. The truck has a place on the farm to-day. This article tells something about the why and the wherefore of the motorization that present conditions make necessary.

A RECENT survey by a competent observer of motor truck conditions in one of the largest and most prosperous of the Middle Western agricultural states revealed the unexpected fact that only five makers were aggressively pushing the sales of such vehicles throughout the territory under consideration. Other designs were being sold here and there in gratifying numbers and sporadic attempts with various models had been made in numerous districts. But throughout the state, thinking of it from north to south and east to west, the report showed that only five companies could be characterized as having gone after the agricultural business with vigor and boldness.

Of the five, three were makers also of passenger cars and the presumption was that the truck sales of those companies went along hand in hand with the sale of their cars. The fourth company was the manufacturer of a complete line of farm equipment, the truck being only one of a number of products that were being marketed throughout the entire district. The fifth, and last of the aggressive merchandisers, sold only trucks—and its sales were becoming broader and broader, its agents and dealers spreading farther and farther in a campaign of efficient distribution and salesmanship.

The Year's Truck Production

"There is a widespread disinclination on the part of passenger car dealers to spend any time trying to sell trucks," the observer stated. "They say, generally, that it takes more time and effort to sell trucks than to sell passenger cars, and they are going to wait before investing in trucks and salesmen until the farmers actually are ready to buy and the trade is coming as easy as the passenger car trade is now. Some apparently high-class business men have no hesitation in saying that they gave up one line of trucks to take on another because the new connection agreed to help sell the trucks."

Truck production schedules for 1920 have been set at 400,000, with the probability expressed that at least 370,000 machines actually will be manufactured during the year, the smaller output being caused by labor shortage and the materials situation. This production would mean that 65,000 more machines must be disposed of in 1920 than were in 1919, the output for that year having been 305,000.

Three markets seem to be presented for the absorption of the 1920 machines. These comprise the export field and the double market of domestic consumption offered by the industrial growth of our cities and larger towns and the agricultural development of the farming districts and the smaller communities dependent upon the farm for their

life. And these home markets seem to present problems of sales as distinct and separate as that of the foreign trade is from the domestic outlets.

Considering these potential fields, the export market, without discounting its possibilities or discrediting the importance of its cultivation, may be passed over for the purposes of this article with the statement that it absorbed no more than 15,500 trucks in 1919. Even with a greatly expanded volume in 1920, the foreign takings can be only a fraction of the total output.

The Domestic Market

Consequently, the greatest bulk of our trucks must be sold within the continental limits of the United States and must be absorbed by interests which are not new but which offer a measure of enlargement to correspond with the enlarged output. The industrial field already has been motorized to an extent overshadowing that of the farm. It has been the largest outlet for our truck production, its needs having been more apparent and more easily recognized; the farm, on the other hand, has been more in the background and less frequently considered. Now, with output mounting to new totals and expanding markets becoming more imperative, it seems that the agricultural districts should receive a greater measure of sales effort and that sales campaigns for the remainder of this year should focus a goodly part of their strength upon such markets.

Farm lands in the Middle West—in Iowa, Kansas, Missouri, Illinois, Nebraska, Ohio, Indiana, Michigan and numerous other states—have soared to unexpected values in the last twelve months, adding a twenty-five, fifty, one hundred per cent and even more to former prices. The land boom has been widespread and its effects will be marked upon agricultural methods and practices in those and other states. Farms doubled in value almost overnight, tenant rents have ascended in keeping with the ascending land price and costs of maintenance, such as interest on investment and on mortgages, necessarily have followed the ladder upward.

Ending the Boom

But the boom already has come largely to a stop in the sky-rocketing of values and the "ultimate owner," after the period of sales and resales, seems generally to have come into final possession of the land. He is the man who will be forced to work out the heavy cost and the heavy investment charges in terms of wheat and corn and dairy products and livestock. Most of the farms that have changed hands were purchased with the first payment due March 1 of this year—which may be assumed to have been

paid—while the remainder, or a large part of it, is not due for five years. Agricultural authorities have stated that many purchasers frequently bought with little more capital than was necessary for the first payments and for carrying them through until the next crop, hoping to earn from high productivity the next and succeeding payments.

Despite the increased value of agricultural products, advanced methods of farming, greater efficiency and improvements of marketing and distribution will be necessitated if these payments are to be met. It has been said that few farmers have increased production per acre more than a small per cent during the past thirty to fifty years and that the farmers' best profits in that time have come from the increase of his land value rather than from the products of his farming. Official statistics of the Department of Agriculture tend to bear out such statements, although some slight inaccuracies will be revealed in a study of the subject.

Acre Production Unchanged

With the corn crop, the yearly acre average from the close of the Civil War onward shows only slight changes from year to year and they could well be chargeable to the differences of the different years. The average acre production of corn during the ten years after the Civil War was 26.1 bushels; in 1918 the production was no more than 24 to the acre. In the intervening years, the product in 1915 had risen to 28.2, the highest of that period, and in 1913, the minimum year, had dropped as low as 23.1. The total production and its value, of course, had risen tremendously, but the average acre production kept at practically the same figures year after year. The increased use of fertilizers and better methods of farming have only offset the deterioration of the land from virgin quality.

Wheat production, in the same respect, has shown somewhat better. The average acre production immediately after the Civil War was 11.9 bushels; the 1918 crop showed a yield of 15.5, and the years seem to be marking a slow upward climb from the first figure, which was, after all, the minimum of the period. The maximum in 1915 had risen to 17 and, excepting 1916 when the yield was low, it has not fallen below 14.1 for some years. Total production and values have increased the same as corn, but the acre average has not risen sufficiently to consider that production methods of the individual farmer have changed greatly in the past years.

However, this article is concerned principally with the knowledge that farm land values have reached a high peak from which it is at least debatable whether the next few years will witness any further advances. The belief is growing widespread that the present values, after last year's upward rush, have become more or less stable and that the farmer now must take his future profits from production—a production that, although having a much greater worth, should and must be heavier and larger.

A Truck Maker's Problem

Land that was worth \$200 an acre but now has sold for \$400 or \$450, as an instance, must increase its output and decrease the unit cost of production per acre, to meet the higher value. The increased sales price of the farm products will not suffice alone. Crops must be enlarged and cost units must be reduced or financial disaster certainly will result to the farmer.

This is an agricultural problem, primarily, but it also is one that has a concern for the maker of trucks, and likewise of tractors. If the farmer's market has been circumscribed and if his labor of delivery and of obtaining his supplies has been excessive, then the truck maker should aid him to cut away the loss by offering better and more up-to-date equipment so that he may range to larger

and more distant markets, thus increasing his returns.

From the merchandising standpoint, the survey mentioned in the foregoing revealed some interesting facts. The most important was the revelation of the farmers' needs for such equipment, as shown by the great number of converted passenger cars and old trucks that were seen to be performing all kinds of duties in the country. Trailers of all sorts and descriptions largely made upon the farmer's own idea and perhaps on his own place out of an old buggy or a worn out passenger car, were witnessed in surprising numbers. Hitched to passenger cars, they were attempting work that should have fallen to the agricultural truck. Passenger car bodies had been changed in every fashion, just as the trailers had been built, and were performing yeoman service.

In many sections, large numbers of trucks had been sold and were more than giving good service. In other districts, farmers stated that little effort had been made to meet their demands. Their communities were without dealers or salesmen, they maintained, or they were unable to purchase machines or obtain equipment and service without long and probably expensive trips to the more distant cities.

"Several trucks formerly sold by dealers are not now handled by them," the report stated. "The change apparently was made because of sales and not for mechanical reasons. A dozen or more instances could be cited of dealers who now are handling no trucks or who have a different truck from that formerly sold. Apparently, many of the trucks scattered over the state in small numbers have been sold by the dealer with the help of the distributor when he first took the agency—and the dealer has sold few if any trucks since that initial venture. Often, it is reported, they have gotten rid of the second truck bought for stock at a low price to get it out of the way. Such instances, of course, are passenger car dealers.

Sales Campaigns

"Passenger car dealers are seldom interested in adding a truck line or in pushing the line they have. There are a few instances of successful truck selling by passenger car firms which do not departmentize their sales. The largest successes, however, are in cases where special men are put on truck sales.

"The prime need in sales campaigns is for information on the use of trucks on country roads. The motor car and truck dealer need this information—they can talk only vaguely of the utility of the farmer's machine. They have no instances of local uses, in many cases at least, to cite to the prospective customer. The dealers publish the advertising supplied by the manufacturer—on how efficient trucks are in distant states—and the farmer answers that the conditions are dissimilar.

"The wholesale grocery houses, as an instance of distributors, the poultry and egg dealers, the produce merchants, and the milk and cream collectors, all are in real need of information on how collection and distribution are handled. The best thing that the industry can do is to insist upon the collection of local data, with as complete figures as possible as to costs and results, to be used locally and throughout the state."

The work being done by the trucks already in use seems to follow out somewhat the already accepted ideas of benefit—principally those of enlarging the farmer's markets by increasing his sphere of selling and of reducing his hauling times and costs both to and from town. Marketing possibilities grow apace with the enlargement of the radius of transportation and instances were shown in which livestock was carried in trucks thirty and forty miles to stockyards and packing plants. In the dairying business, farmers too distant from the railroad or interurban to market

by horse-drawn vehicles were enabled to reach these sales points with little difficulty. And, perhaps unexpectedly, the use of trucks was not found to have cut into the business of the interurban lines; rather it was shown that the larger truck radius would enable the line to cut down its number of stations and consequently its cost and time of handling various shipments.

A growth was seen also in the facilities for local packing houses and slaughtering plants. During recent years, there was a lessening of such activities, due principally to the difficulty of obtaining sufficient stock. But, with the advent of the motor truck, a resumption of such plants was shown as it became more evident that supplies could be assured.

Of course, the tasks of carrying the farm products to the markets and the return of such loads as supplies, feed,

etc., formed the larger part of the actual use by farmer-owners of their trucks. But this took sometimes unexpected turns. One was the movement of high-grade stock, particularly of breeding animals, from one farm to another, sometimes hundreds of miles. Another was the moving of hay and forage, and even water, to herds threatened because of drought or other emergencies. In the winter, when severe storms killed large numbers of cattle, trucks were utilized in speedily obtaining the hides, a service frequently impossible without such machines.

The state under survey was one in which the railroads were principally east to west lines, with few crossing from north to south. These trans-continental lines, of which there were several, sometimes were as far apart as fifty miles and communication between them was only by road. There, the trucks were performing unusual but extraordinarily necessary services.

A New Light Piston Alloy

DOW-METAL is a light alloy, manufactured by the Dow Chemical Co., which has been brought to the attention of automobile engineers within the past few months. It differs from other light alloys in that it contains over 90 per cent of magnesium, while the others are composed largely of aluminum and contain magnesium only in small amounts, if at all. The following facts concerning the development of the alloy and its properties were furnished by the company.

The production of magnesium was undertaken by the Dow company early in the war when foreign supplies, which had previously been obtained from Germany, were cut off. The company possesses a supply of raw material for the manufacture of magnesium in the brine pumped from its numerous wells and from which many chemical products are obtained. Among these products is the salt magnesium chloride, which is extracted from the brine, and after suitable preparation is used for the manufacture of metallic magnesium. The process employed is electrolytic, a heavy direct current being passed through a bath of the molten salt. The salt is decomposed by the current. Metallic magnesium is formed, which on account of its extreme lightness floats on the surface of the molten bath, and is skimmed off from time to time.

In the past the demand for magnesium was limited, owing to the fact that no alloys of it had been discovered which possessed the mechanical properties necessary for its use in engineering work. The demand was principally for use as a deoxidizer for non-ferrous metals, and for military purposes. Realizing the importance of discovering alloys combining the lightness of magnesium with mechanical strength, in order to create a wide market for its product, the Dow company undertook extensive investigations of the subject. A research department was established and of many alloys studied up to this time, a number have been found to possess desirable properties. Of the latter, one has been developed to the point where the manufacturers feel justified in recommending it to the automotive industry as a casting alloy, particularly adapted for use as a piston material. We understand that tests on Dow-metal pistons have been made in over forty engine manufacturing plants the past year, aside from the tests made by the Dow company itself.

The following table gives some of the more important physical constants of Dow-metal:

Specific gravity	1.79
Tensile strength	22,000-25,000 lb. per sq. in.
Yield point	12,000-14,000 lb. per sq. in.
Compressive strength	45,000 lb. per sq. in.
Elongation, 2 in.	3.5 per cent
Reduction in area	3.5 per cent
Modulus of elasticity	9,000,000
Brinell hardness	55.

With a specific gravity of only 1.79, Dow-metal has only one-fourth the weight of cast iron, while the common aluminum alloys are 50 per cent heavier.

Heat treatment increases the tensile strength of sand castings to 30,000 lb. per sq. in., without causing any appreciable change in yield point, while the elongation and reduction in area are increased to 6 per cent. Dow-metal can be forged with an increase in tensile strength to 50,000 lb. per sq. in., and a Brinell hardness of 70.

The heat productivity is 0.295, as compared with 1000 for pure copper and 0.108 for cast iron. The coefficient of linear expansion, over the range from zero to 800 deg. F. is 0.000028. This coefficient appears to be high for a material to be used in pistons. However, this expansion is not accompanied by any permanent growth, as in the case of aluminum alloys. In one test, a bar was subjected to 21 heatings of two hours each at 800 deg. F., and showed an increase in length of only 0.0003 inch per inch. In practice, pistons are fitted to the same clearances in the cylinder as are commonly given to aluminum pistons.

The machining qualities of Dow-metal are excellent. No cutting compound is used, while the machine may be run at high speed, without heating or dulling the tool. The metal takes a brilliant finish, without tearing. As compared with cast iron, only about one-third the time is required for machining.

The first test set of Dow-metal pistons was installed in a Ford engine more than a year ago. The car has been in constant service since that time.

Owing to the fact that in very powdered form magnesium burns readily when ignited, and hence has found a use in flashlight powders and for military purposes, it is sometimes questioned whether it can be used for other purposes. As a matter of fact, aluminum is equally inflammable when finely powdered, and finds extensive use on that account, as in the thermite process. In solid form magnesium is not inflammable.

The Dow company regularly recovers all its shavings, which can be melted up and recast.

Designing a Lighting Plant for the Export Field

Sales problems in the foreign market frequently demand different solutions from those of domestic origin. The description herewith shows briefly how one firm has reconstructed its lighting plant for such sales.

IN a recent attempt to construct a lighting plant that would be particularly suited for the export field, the designers found themselves faced with the two-fold problem of overcoming the sales resistance to American products and of constructing a unit that would occupy the least amount of shipping space. The sales resistance, which is also encountered with many other products manufactured in this country, seemed largely due to a desire on the purchaser's part for a machine presenting a more compact and attractive appearance. European practice in many lines, it was found, is to seek a finished appearance, more pleasing to the eye. In addition, it was necessary to keep up the standard of quality.

With these demands as a basis, the plant, which has been marketed under the name of Plix, was designed so as to closely resemble an automobile, with a honeycomb radiator, extended tank, and hood sides. The power and generating unit has much of the appearance of a motor car bonnet, and demonstrators and salesmen are instructed to state that the plant can be operated the same as the automobile and with no more difficulty. Such a sales point has been found valuable in approaching a prospect who owns or has operated a car.

The change of design was accomplished principally by changing the cooling system. In the original plant a large cylindrical water tank was carried upon the rear of the base, the system, of course, being of the simplest nature. This was altered so that a honeycomb brass radiator, with an extension tank, was fitted above and in front of the single cylinder engine. The cooling is assisted by a four-blade fan, as in automobile practice, situated directly back of the radiator, and the whole, including the engine, is enclosed by enameled sides dropping down from the tank and conforming to the shape of the radiator. The fuel tank is placed directly in the rear of the water tank and is, of course, in keeping with the general style of construction.

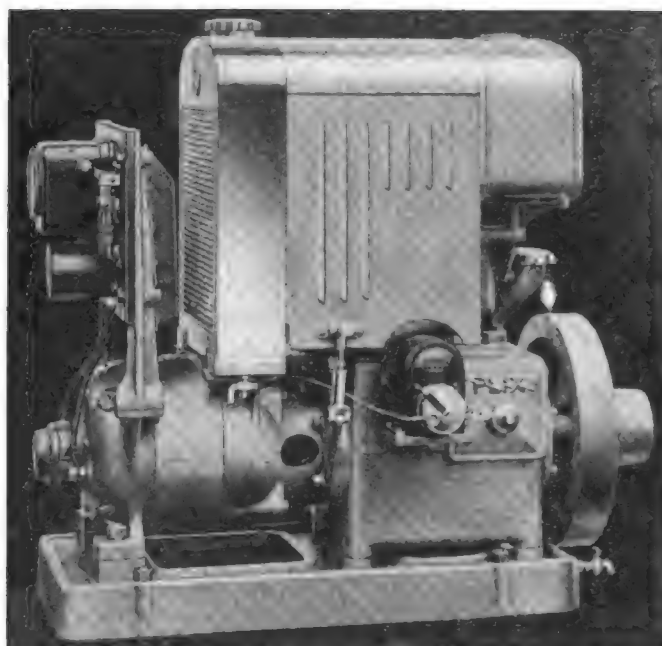
Another departure from domestic practice is the installation of a Bosch magneto instead of the usual timer and

coil. Foreign demand was interpreted as wishing such a system, although the cost of construction has been increased thereby. The magneto is driven direct from the camshaft.

The engine is four cycle, single cylinder, 3 x 3 in., having a rating of 3.6 hp. at 1250 r.p.m. The camshaft is located at right angles to and above the crankshaft and the valve mechanism, including camshaft, bearings, gear and tappets, is mounted on a bearing plate so that it may be removed as a unit. Lubrication is by splash, and the cooling system—since the plant is for export—was planned not only for the hottest but for the coldest climates. The plant is started by pushing a starter button on the switchboard, extensions of which are possible to other places.

The generator is a unit with the engine, wound for 32-37 volts, and is of General Electric construction. It is driven by the crankshaft direct. The generator unit, which includes the engine and switchboard, is on a metal base, with a power pulley secured to the flywheel.

A Willard 16-cell battery, rated at 80 ampere-hours on an 8-hr. discharge rate basis, is furnished with the plant. The plant is sold as of 65 light capacity and the engine is designed to run on either gasoline or kerosene.



Magneto side of the Plix lighting plant, showing the automobile construction

Advantages of Special Steels

IN his presidential address to the Institute of Engineers and Shipbuilders in Scotland, Dr. T. Blackwood Murray pointed out, as an example of the advantage of using special steels, the fact that the weight of a motor car gear is less than 12 per cent of the weight of an electric crane reduction gear transmitting a similar load at similar speeds. He also dealt with the increasingly important part played by aluminum alloys in the construction of motor vehicles and aircraft, and said that a new light piston alloy, the chief constituent of which is magnesium, with a specific gravity of 1.74, had appeared in America.



The FORUM



Heat-Treated Axle Tubing

Editor AUTOMOTIVE INDUSTRIES:

IN the April 1 issue of your magazine I note in an article entitled "Government Test of New Heating Furnaces" a statement in the last paragraph, "up to the present time no axle tubing has been produced in quantities which will meet the requirements of Specification 10,229, calling for 200,000 lb. tensile strength with 5 per cent elongation in 2 in."

I would like to call your attention to the fact that during the war this company offered the United States Government the use of the electrical heat treating process which we had developed and which would produce in steel tubing of the analysis specified for aircraft axles a product more than meeting the government specifications. In this connection, we heat treated some axles for the Dayton-Wright Airplane Co. and their report to us on their own test gave the following results:

Elastic limit, 198,600 lb.

Ultimate strength, 223,500 lb.

Elongation in 2 in., 6.0 per cent.

The second test on tubing drawn back to a lower temperature gave an

Elastic limit, 220,500 lb.

Ultimate strength, 246,000 lb.

Elongation in 2 in., 6.5 per cent.

This process was available at the beginning of the war and all through it, and the necessary capacity for heat treating the axles of all aircraft produced by this country could have been developed in two months time; it is now in daily use in our plant. During the war we furnished a large number of heat treated tubular axles and other landing chassis members to the Standard Air Craft Corp. for use on Handley-Page machines. After the termination of our work with them, they wrote us saying, "We wish to take this opportunity of expressing to you our appreciation of the careful way you handled the entire matter, particularly in reference to the heat treatment of the tubing. The writer has been familiar more or less with the heat treating process in vogue during the past ten years, and from tests made on the tubing heat treated by you at your plant, we believe the process you used and the results obtained are far superior to anything we have ever seen."

SNEAD & COMPANY,

Vice-President, H. P. MacDonald.

British Tractor Trials

Editor AUTOMOTIVE INDUSTRIES:

AN arrangement has been made whereby the Society of Motor Manufacturers and Trades, Ltd., and the R. A. S. will unite during 1920 for holding a tractor trial, to the end that the waste of time, money and effort which would inevitably be entailed in the event of two trials being organized in one year will be eliminated. As an exhibition, there can be no doubt whatever that it will be considerably strengthened and its value enhanced by the union of these two powerful bodies. In the event of the interest being divided, neither trial would have had

that advantage. Some makers would have clung to the S. M. M. & T. and others to the Royal, for each society, besides having its own special call for preference, also has its own strict adherents. One of the principal benefits of such a trial to the farmer—the opportunity of seeing all or any machine at work and making comparisons on the spot between the actual performances under similar conditions—would thereby have been lost. As things are, the trial will be a fully representative one.

From certain statements which have appeared in the press, it is evident that some misapprehension exists as to the real circumstances which have determined this course. It may be useful, therefore, to examine the events which led to this decision.

It was the intention of the S. M. M. & T. from the commencement to make their trial an annual affair, in the same fashion as they have adopted in connection with motor cars at Olympia.

When it became evident that the R. A. S. intended to hold a trial during 1920, the S. M. M. & T. as manufacturers found themselves faced with the possibility of having to stand the expense of attending two trials in one year. Steps were immediately taken to ascertain the opinion of tractor manufacturers generally as to the advisability of limiting the number of such exhibitions and the consensus of opinion was strongly in favor of there being one representative event each year.

The S. M. M. & T. then approached the R. A. S. with a view to ascertaining whether it was feasible to join forces, and, after some little discussion, it became apparent that there was really, apart from the question of making the trial competitive, no difference of opinion between the two bodies. The R. A. S. invited the S. M. M. & T. to nominate a committee of five who would confer with an equal number of members of the Implements Committee of the R. A. S. in making arrangements for the trial.

H. SCOTT HALL,

Tractor Trial Organizer, S. M. M. & T.

Axle and Hub Standardization

April 15, 1920.

Editor AUTOMOTIVE INDUSTRIES:

I HAVE read with a great deal of interest Mr. Schipper's article in AUTOMOTIVE INDUSTRIES of April 1 on axle and hub design. The matter is very well presented, indeed, and I think you make a very courageous fight for simplification of design without placing the matter in an offensive light to manufacturers of complicated types of articles.

Undoubtedly the article will accomplish a great deal of good in compelling thought along the lines you suggested. It is undoubtedly the purpose to reduce practically the number of sizes to at least nine for all passenger car equipment, no matter what type of axle is used. If the simple type of live axle is used this number of sizes could be reduced to five to accommodate all sizes and weights of cars in the passenger car field.

DETROIT PRESSED STEEL COMPANY.

A. L. Putnam, General Manager
Disteel Wheel Division.

The Course of Labor and the Workers' Tendency in Great Britain

This is the second of two articles on English labor by Mr. Northcott, the first having been published in the issue of March 4. In this, he takes up the problems involved in obtaining high production. Its interest to American manufacturers is that it indicates what might be expected if workers in the United States followed the lead of their Anglo-Saxon brothers.

By Clarence H. Northcott

WHAT is the attitude of labor in Great Britain toward increased production? The answer to this question may decide the industrial future of the country. For labor holds the key to output and production and, thereby, to trade, commerce and industry. Great Britain has suffered a great loss through the war in respect to her producing power, her trade, her shipping and her financial strength. Seven millions out of about nine millions of her men of military age were called into the army or navy. For three or four years this great body of producers was withdrawn from her factories. Eight hundred thousand of them lie dead on the field of victory, while large numbers of them never again will "pull their weight" in the industrial struggle. Great Britain hazarded her financial and maritime supremacy also in the fight for victory, and emerged at the armistice with a heavy leeway to make up.

The country's reduced man-power and the vital necessity for rebuilding her economic future have given labor a strategic position, of which it has not been slow to avail itself. How it has obtained shorter hours, higher wages, stronger and numerically more powerful organization is not the story of this article. What is important to notice is that organized labor can hold up production. At the close of 1918, the membership of the registered trade unions had reached 6,620,000, an increase over 1914 of more than 57 per cent. It is probable that the trade unionists of Great Britain now number 7,500,000, which constitutes a very large proportion of the manual laborers of the country.

With such strength, the attitude of labor toward output is of vital moment. Let it be said frankly that there are labor leaders who have been fearless and outspoken on the subject. The railway stations of the country are placarded with statements from J. H. Thomas, M.P., of the National Union of Railwaymen; William Brace, M.P., of the South Wales Miners; J. H. Clynes, lately the Food Controller, and John Hodge, of the Iron and Steel Smelters. All emphasize the absolute necessity of increased production. J. T. Brownlie, chairman of the executive council of the Amalgamated Society of Engineers, brought the need for increased production before the Trade Union Congress last September and has since dealt pointedly with what he calls the imperative necessity "that the essentials of life should be produced in abundance, thus lowering prices." Everywhere, almost, among the moderate-minded and responsible leaders of labor, one finds a wise grasp of the economic importance and necessity of increased production and an insistence on it in the interests of the whole of mankind.

But in general, labor is little interested in increased production. Whatever the labor leaders may think or suggest has not penetrated the consciousness of the rank and file. The latter have a conventional standard of living as measured by the pay envelope; they do not see either a use or necessity of continued toil. The miners are notorious for their readiness to stay away from work when they have earned their usual wages. Their action may make coal dear to their fellow Britishers and cause Frenchmen and Italians to shiver through a dreary winter, but that does not concern them. If they worked harder and longer, they would earn more and thereby come under the provisions of the income tax. Their objection to the income tax is well known. Nor is this objection confined to the miners. Authentic cases in various industries have been cited to me in which men have deliberately cut their earnings, alleging in explanation that they were not going to earn money to be paid to the government in taxes. So, too, I have been given authentic cases of tailors who are earning wages so much beyond anything they had previously earned that they insist on two days' rest per week, not returning to work on Monday.

A systematic investigation of the metal trades of Great Britain has recently been made by *The Times*. An amazing revelation was given of the forces adverse to production that are to be found at work in practically every industry in the country. Much of the strength of these forces is centered in that preference for day work rather than piecework, which is one of the distinguishing characteristics of the British workman. Yet this very characteristic is crossed by an adherence to local customs that will cause piecework to be accepted in one part of the country, while resisted in another. While there is a strong feeling among the metal trades against the piecework system and, of course, any allied forms of premium bonus, a significant minority of the workers in the metal trades favor piecework with its incentive to increased production. Thus, of the firms replying to the above-mentioned investigation, 30 per cent stated that they had met with no appreciable hindrances to production.

It should be made clear at the outset that the iron and steel workers and those engaged on blast furnaces have a deeply-rooted preference for piecework. They are a highly organized group of skilled men. They work in a team or gang, each one contributing equally to production and each liable to be called upon for extra effort to meet an emergency. For reasons difficult to

summarize in their totality, they have had a history almost devoid of strikes. Their wages are regulated by national and district agreements providing for conciliation boards, which have drawn up intricate wage scales. Under these circumstances, no opposition to full production or to any system of payment by results is to be found.

Among the illustrations cited in the above investigation were three works making motor chassis. These have a system of payment by results, which met with practically no opposition. A Lancashire firm of general manufacturing engineers and a Scottish firm of hydraulic and constructional engineers reported a similar experience. One large Midlands firm manufacturing wagons and another making cranes found their men almost solid in their defence of the piecework and bonus systems under which they were paid for all they produce. In the shipyards, both on Tyneside and in Ireland, there was a considerable body of believers in piecework, although this was not always a guarantee that the fullest productivity would be given. An agreed output, measured by a certain weekly total of earnings, may mean a considerable restriction of production. Wherever normal effort is given on piecework, the earnings of workers are found to display all that diversity that arises from differences of skill, strength, temperament and economic need. Where uniform earnings are found, therefore, one may reasonably conclude that restriction is present. Such a result was found in the experience of an engineering establishment in the Midlands where 8000 hands were employed. Here men on the same job turned out almost identical quantities, thus demonstrating the presence of an organized and irrational restriction. In contrast to this it is interesting to observe that the Priestman bonus scheme, whereby an attempt was made to organize and reward increased output, received the formal endorsement of the trade unions concerned.

Production Diminution

Diminution in production follows upon the transition from piecework to daywork. In the middle of the war the Amalgamated Society of Engineers made a determined effort to abolish piecework, and succeeded in a large percentage of cases. A large machine engineering works estimated that this action resulted in a decrease in production to them of 50 per cent and more. In the case of a large engineering firm in Ireland, the workers were compelled by the A. S. E. to go on to daywork against their will and that of the management, with an immediate drop in output of 20 per cent. Just what piecework means for increased production, so far as the workers themselves are prepared to measure the increase, is suggested by a clause found in agreements in trades where piecework is in vogue. In these cases piecework rates must guarantee a pieceworker of average ability a wage higher than that of a dayworker by from 25 to 33 per cent. This provision is advocated and defended on the ground that a pieceworker produces that proportion more than a dayworker. If this contention of a large number of unions be correct, then the refusal of such workers as those in the building and metal trades to work at piece or premium bonus rates is thereby condemnable as a refusal to give the full measure of production.

Restriction of production results also where workers seek to cut out the third shift, in a three-shift day, or refuse to work overtime. During the year 1919, the Amalgamated Society of Engineers refused to work overtime, with the result that new production schemes were delayed or thrown aside. The shipbuilding of

South Wales, the automobile manufacturing of Coventry and the general metal trades of Birmingham all reported this as a factor in their inability to deliver goods on time. The coal ports of Wales also reported a serious curtailment in the export of coal because tippers and trimmers had refused to work a third shift per day and had reduced Saturday work to one shift.

The reduction in hours of labor has been quite a significant factor in connection with output. Since the armistice Great Britain has experienced a most remarkable reduction in the hours of labor. During 1919 this reduction was greater than the cumulative effects of a quarter of a century's action prior to the war. In one single year British industry suffered a widespread and far-reaching diminution in the opportunities for production. At the end of 1918, the average hours in industry ranged from 48 in progressive establishments to 60 in others. At the close of 1919 the former establishments had reduced to 44 hours, while few industries could be found which worked more than 48 hours. Altogether 6,400,000 workers had received an average reduction of 6½ hours per week per head. The cotton industry had reduced from 55½ to 48 hours; the metal trades from 54 to 47; printing trades, which formerly worked 51 hours, now work 48 hours. In the transport trades, the average reduction per head for the workpeople affected was nine hours per week.

This reduction in hours has always been accompanied by reduction in output. In one industry where the reduction in hours reached 15 per cent, it was pointed out by the workers' leaders that this reduction need not mean correspondingly decreased production, and they confidently anticipated that the decrease would not be more than 7 per cent. Results proved that the decrease in production almost equalled the decrease in hours. There is no industry in Great Britain where reduced hours have led to increased output by diminution of fatigue or by any direct result attributable to reduction of hours as a prime cause.

The coal miners, now working seven hours a day, are realizing almost the same total weekly output as on the eight-hour day, but only as the result of an increase in labor power. In South Wales the number of persons employed underground increased during 1919 from about 190,000 to about 215,000, but the output declined from about 23½ tons per person to 17½ tons. On the railways the 8-hour day is responsible for much congestion which, in its turn, is seriously affecting production and the revival of industry. In the shipping centers delays in loading, discharging and bunkering have resulted from the reduced hours and the general carelessness of labor concerning output and effort, so that shipping is losing an amount of time estimated at 30 per cent.

The reduction in hours of labor has been accompanied by what could, without exaggeration, be described as a wage revolution. Wages have risen to a height and to a degree never dreamed of by Great Britain in the pre-war days. In every case of reduction of hours, there was a condition that weekly time wages should be adjusted so that workers would not lose financially by the changes in hours. This was equivalent to the same wage for shorter hours. When these shorter hours were accompanied by reduced output, it was obvious that higher wages had come to mean not only reduced output, but higher cost of production per unit. But wages did not remain at the same level during 1919. As hours were reduced, by trade union pressure, so wages were increased even more.

This advance in wages dates back to 1917. In 1918,

about six million workers received an average advance of ten shillings per week. In 1919, more than five and a half million workers received an aggregate increase of over £2,100,000. Wages have now reached a figure that could never have been imagined before the war, and most competent observers estimate that they will remain somewhere near these figures for some years to come. While these wages are not in themselves subjects for concern, they will readily become heavy burdens upon industry if they are accompanied by any organized system of restriction.

In this economic platitude lies the whole significance of the attitude of labor toward production. But its organized strength labor has forced up wages and reduced hours. If it is using its organized strength to reduce production at the same time, it is blazing a trail to national bankruptcy and poverty. It may not realize what will be the effect of its actions, a fact which makes the situation the more tragic.

It is, therefore, a matter of some concern that employers in the investigation made by *The Times* debit to trade unions' action much of the opposition to full production there discussed. In the case quoted from the Midlands, where a uniform production was found among pieceworkers, concerted trade action was obvious. The refusal to work overtime or a third shift was an open and overt act of the A. S. E. The motives prompting these acts are obvious but do not excuse their stupidity. The A. S. E. was seeking to reduce unemployment among its members. They have not learned that production breeds production. The workers in the Midlands factory were seeking either to avoid forcing the pace for the slowest men or to get a better piece rate for new jobs.

Blind and Stupid Measures

Behind this restriction and the blind and stupid methods by which it is enforced are two motives that must be given due weight. These are instances of the fear that dogs the step of the workman in competitive industries. One of these types of fear is common to the United States; the other is avoided there by a wiser wage policy. The first is the fear of unemployment. Men argue that production at full capacity will only result in working themselves out of a job. Their experience in the past has shown that periods of feverish industrial activity have been followed by cycles of severe unemployment. They have not the knowledge or economic vision to appreciate the starvation, both physical and industrial, besetting the world to-day and constituting both the challenge and the necessity for increased production. They act and argue like men afraid to venture on to new paths.

An illustration of peculiar interest in this connection is afforded by the offer made by a large manufacturing firm to certain builders in its employ. This firm, like many in Great Britain to-day, was engaged in building a model village some distance away from the city boundaries. During the bad weather of November and December the workmen on these houses suffered much broken time and came to ask whether the firm could not offer them the benefits of an unemployment fund such as its employees in its own factory had. The firm replied that it would be willing to do so if the men themselves would contribute to it. Further they would give a large number of other benefits if the men would "put their backs" into the building of the houses so urgently needed for their fellow workers. One of the proposals made required the endorsement of their trade union, without which it was impracticable. The men had hitherto walked from the city boundary to the village, for

which they were allowed half an hour and, following trade union regulations, were paid for that time.

The firm proposed that the men should report on their work at the hour at which they had previously left the city boundary. This would mean that they would have an extra half hour within the limits of the agreed working hours of the winter day for actual work on the building. The firm proposed to pay them overtime for this half hour at the rate of time and a half, suggesting that the extra "half" time should be the men's contribution to the unemployment fund, which they themselves would double. The union representatives, despite the fact that the men wished to make the arrangement in order to get an unemployment fund and despite the saving in time and cost in the erection of workmen's houses, declined to sanction the arrangement on the ground that their rules forbade overtime. In reality, the fear that they would build the houses more rapidly than normal and would thus work themselves too quickly out of a job was the motive prompting such a decision on the part of the union.

Fear Wage Cuts

The second fear which besets the British worker and leads him to "soldier" on the job is that his high earnings will be followed by a cut in piece rates. To American employers and workers alike, this will appear irrational. Unfortunately for the credit of British employers, there is too much ground for such fear. British employers in the past have unwisely held to a conventional wage, beyond which they thought a workman should not be allowed to earn. They had no clear notion of the economy of high wages. They did not measure their business success so much by reduction in costs and increase in efficiency as by the size of their wage bill. They have, therefore, a large share in the creation of the present irrational fear that the workers, by increasing production, are only preparing a rod for their own backs. Nothing but a long education in fair dealing with piece rates will remove this obsession.

It is not fair, however, to ascribe all the decrease in British production to the employers alone. During the war, many industries were allowed to run down, so that their mechanical efficiency is below par. The miners claim that the underground ways in the mines are not in good repair, that the mechanical apparatus has been relatively neglected and that material for timbering and other operations subsidiary, but necessary for output, is scarce. In the building trade, the co-ordination of supply in respect of materials has not yet been re-established after the war. Difficulty in obtaining raw materials is often supplemented by scarcity of a particular kind of labor. Thus, a building may be waiting one week because of a scarcity of cement, and a few weeks after when a supply of cement has been obtained operations may be delayed because enough joiners cannot be obtained. A failure to co-ordinate the processes of production may lead to a relative decrease. Thus, in one case of refusal to work overtime cited to me, the machine shop of an establishment had run ahead of the moulders. The latter were asked to work overtime to enable the engineers to get ahead. Their refusal to do so meant that production in that establishment was relatively curtailed.

A very large amount of restriction in production at present is due to the congestion on the railways and the difficulty of transport. The supply of railway wagons was not kept up during the war. The armistice found many thousands of these wagons in France. They have not been returned. This scarcity of wagons has been made more serious by other dislocations on the

railways and the difficulty of securing transportation is one of the perpetual troubles of the business man to-day. The steel manufacturers of Tyneside have issued a statement that the position in respect to transport for the coming year means that no new plant can be put into operation. They estimate that, if they stopped their works for a month to enable the railways to do what they could in that period to clear off arrears of transportation, their works would still have to continue for some time on restricted output. While such a position obtains, it is not just to ascribe all the restricted output of Great Britain to labor.

The Serious Situation

But no amount of explanation can remove the seriousness of the situation confronting the industry of a country, where labor is not giving full output. What must follow if restriction is continued can be learned from the recent action of the well-known English piano manufacturing firm of John Brinsmead & Sons, Ltd. This firm, whose name is a household word in Great Britain, notified its employees that it would close down its manufacturing sections on Feb. 11, 1920. In a circular letter to each of its 300 highly skilled employees, the firm's manager said:

"You are aware of the low figure to which the output of the factory has fallen. For each piano despatched per week there are now 26 employees, against 12 in 1918, and six immediately before the war. The factory wages alone per piano exceed the selling price. The cost of polishing only is approximately equal to the pre-war prime cost of the completed piano, including materials."

Another member of the firm, discussing the reason for the extraordinary rise in cost of production outlined above, suggested how far labor had affected the position. He remarked:

"I am afraid it is this question of output, not only in our own but in most trades, which is causing the ruination of the country. The trouble is that we are not getting the pre-war output from our workers. I do not know the reason, but that is the fact."

The retort of the workers to the above charge has been that the organization is bad. This retort puts the whole contest concerning labor and output into a nutshell. British industry can overcome the incubus of high wages by increased organization and better management, but no measures can avail against a concerted decline in the quantity and efficiency of output. The end of such action is national bankruptcy.

This the British workman may be expected to see ultimately, even if somewhat late in the day, and to do his part to retrieve his nation's industrial position. The twofold fear of unemployment and of a cutting of piece rates can be removed. It is generally recognized that measures to relieve unemployment are the outstanding need of British industry. Several industries are giving attention to this matter and formulating schemes. The provisional committee of the joint council of employers and workers have recommended such action. The builders' national parliament has suggested a method for reducing the burden of unemployment in their trade, which is probably one of the most seasonal. On the question of piece rates, a wiser policy is coming into vogue. The rising wage market has made the cutting of piece rates an almost impossible operation. Employers are learning from the present experience that it pays to give good wages. They have been compelled, as seldom before, to yield piece rates

satisfactory to their organized workers. They have found that, as a consequence, production has leaped up greatly, yielding high earnings to their employees. After they have got over their first shock and have put their newly installed cost accountants to work, employers have discovered that the increased output is being produced at a smaller cost per unit.

Must Learn Wage Economy

Before production can be increased largely, British employers must learn the economy of high wages. They must accept the responsibility of management to enable wages and costs to move in inverse order, so that higher wages mean lower costs. They must convince the workers that they will give them "a square deal" in the matter of piece rates, which they will not cut except by mutual consent. There must also be an advance in the efficiency of organization of their businesses, in the use of machinery and in the availability of transport alike by rail, canal and sea. On their part, the British workmen have much to learn. They must be relieved from the fear of unemployment and from the bondage of the short-sighted theory that restriction of output on the part of one group means more work for another group. They need to be educated to the necessity and value of efficiency in production.

A blind, complacent faith in their ability to muddle through and a smug confidence in the superiority of British craftsmanship may be all very well, but they do nothing to help Great Britain out of its financial difficulties or to meet the needs of an impoverished world. The British workman is slow to seize new ideas and slower still to grow alarmed at dangers that are obvious to people looking on at the industrial struggle. He remains an individualist in his thought, and must himself be convinced of the necessity for a course of conduct that his leaders have long recognized. Where he can, therefore, by education and the pressure of national necessity, be convinced of the need for production, he will yield it in large quantity and superb quality.

Box Handles of Webbing Save Shipping Space

IN export shipment, boxes loaded with 200 to 300 lb. are most easily manipulated when provided with handles. Usually such box handles are made of rope, inserted through holes in the ends of the box and secured with wall knots, or inserted in grooves on the under side of the cleats on the ends of the box, and held in place by nails or screws driven through the cleats.

The former method of fastening has the disadvantage of taking up valuable space in the interior of the box. The latter increases the thickness of the cleats to provide for a groove of sufficient depth to hold the rope, thereby increasing the displacement of the box. Since the rates for export shipments are virtually based upon the cubical contents of the package, the displacement is an important factor.

A box handle made of webbing instead of rope has been suggested by the Forest Products Laboratory as a means of conserving space. For this purpose webbing about $\frac{1}{8}$ in. thick and $1\frac{1}{8}$ in. wide, which has a breaking strength of 800 lb., should prove suitable. It may be inserted through saw-cuts made parallel to the grain in the ends of the box, turned down flat inside, and nailed securely with large-headed roofing nails.

Such a handle takes up no extra space. It is easily made and has a lifting strength with a large margin of safety.

The Need for Trained Highway and Transport Engineers

Although millions of dollars are available for road building, the trained personnel to direct the work has been lacking. Also, men cannot be found to supervise and operate the great fleets of motor trucks that are becoming such a factor in the nation's transportation problems. Consequently, the conference here related assumes important proportions.

PLANS for enlarging the scope of universities with the view of graduating trained highway and transport engineers were given impetus at a conference held at Ann Arbor, Mich., on April 15. The meeting was arranged by Roy D. Chapin, president of the Hudson Motor Car Co., in co-operation with the National Automobile Chamber of Commerce and the United States Bureau of Education. Leading authorities from educational institutions, officials of the N. A. C. C., road experts and leaders in several branches of the automotive industry participated.

The conference was called to express views that will be presented at a meeting in Washington to be presided over by P. P. Claxton, head of the Educational Bureau, at which definite steps are expected to be taken looking to development of plans along this line. Upon motion of Walter C. John, of the United States Bureau of Education, a committee of five—consisting of Professor A. H. Blanchard, in charge of highway engineering and highway transport at the University of Michigan; G. C. Diehl, chairman of the good roads board of the American Automobile Association; W. K. Hatt, professor of civil engineering Purdue University; Mr. John, and R. C. Hargreaves, vice-president of the National Highway Traffic Association—was named to draw up resolutions giving the result of the deliberations.

The Resolutions

"Whereas, American science and the industry has forged a new unit of highway transport destined to bring about far-reaching changes in life and thought, not only in this country, but in the world;

"And, whereas, it is a vital necessity to the economic development of these problems, not only in economical location, construction and maintenance of highways, but in the preparation of skilled men to undertake both the administration and operation of industries devoted to the production of those units of transportation;

"And, whereas, the American people have appropriated millions of dollars, which must be expended efficiently and intelligently;

"And, whereas, these problems call for the highest collegiate and vocational preparation which can both be solved through development of collegiate and vocational education in highway engineering and highway transport;

"Therefore, be it resolved, we representatives of education, industry and the government call upon P. P. Claxton, United States Commissioner of Education, to bring this to the attention of the people of the United States through a conference of leaders in thought and action on this subject;

"Be it further resolved, that in order to assist and advise with Dr. Claxton, the chairman of this conference is directed to name a committee of three representing industry, education and government."

Mr. Hargreaves, who acted as chairman of the meeting, appointed Mr. John, T. H. McDonald, director of the public road department at Washington, and Pyke Johnson on this committee.

The Need for Engineers

Discussion brought out the great need of industry in all branches for highly trained engineers to deal particularly with the problem of highway construction and highway transport. Evidence of the willingness and desire of college authorities to co-operate in bringing about a program that will meet this enormous demand was shown in the remarks of the speakers of that branch of the conference.

The matter of finances alone was declared to be the stumbling-block in the way of greater development along such lines in American institutions. Suggestions that the problem be solved by industrial leaders in selecting certain institutions in all sections of the country and endowing chairs of engineering were advanced by the college authorities and appeared to have been received favorably by the conference members.

In opening the meeting, Chairman Hargreaves spoke of the need for college trained engineers. He said the automobile had solved the problem of keeping hired hands on the farm and declared that in the construction and maintenance of highway transportation lay the future development of the country.

Mr. Chapin spoke at length on the dearth of competent highway and transport engineers. He stressed the point that this effort was not in behalf of the automotive industry but for the benefit of the entire country. He also presented figures showing that more than 7,500,000 automobiles are running on the highways of America today, and, figuring on a conservative basis, 25 per cent of the more than 100,000,000 inhabitants are riding in motor vehicles every day. The proper knowledge of soil to permit comprehensive road construction as well as trained minds looking to the upkeep of this immense fleet of motor vehicles and the roads upon which they travel, he declared, called for highly sensitive minds with the experience, judgment and balance that is furnished by a college training.

Knowledge of Soils

Frank F. Rogers, State Highway Commissioner of Michigan, who appeared as representative of P. D. Sargeant, president of the American Association of State

Highway Officials, gave a résumé of the situation from the standpoint of the road engineer. He declared highly trained men who knew soils alone would solve the problem of road construction. The ordinary road engineer, Mr. Rogers said, knows little of the fundamentals that enter into his duties and this lack of knowledge, he charged, was responsible for the short life of the modern road-bed.

H. G. Shirley, of the Federal Highway Council, said the problem of soil must be solved before road-building could be done properly and economically. The success of the transportation system, he declared, depends upon the structure of the road, adding that it was the function of colleges and scientific departments to get to the fundamentals and know the entire structure of roads so as to build intelligently. "We want roads so built that they can carry the same load from the Atlantic to the Pacific," said Mr. Shirley.

E. T. Herbig, chairman of the educational committee of the National Association of Truck Sales Managers, cited the need of efficiently trained men in the road departments. He said there were 700,000 motor trucks in service to-day, the initial cost of which was \$2,000,000,000, and predicted there would be 1,000,000 in service by the end of 1920. "We are not selling motor trucks, we are selling transportation," he said. "The problem of loading and routing is the big feature, and there is need for the trained transportation engineer to master those problems."

Mr. Herbig said the motor bus was coming into use rapidly to take the place of the street car and he urged the trained driver as being necessary for the proper maintenance of these transportation systems. He voiced the need of the college trained engineer, not only in America, but every country, and told of the great opportunity afforded by this branch of science.

Activities of the S. A. E.

F. W. Davis, consulting engineer of the Pierce-Arrow Motor Car Co. and representative of the Society of Automotive Engineers, told of lecture courses at his factory designed to teach men the problem of truck transport and transport engineering. He told of the efforts of the S. A. E. to get the underlying facts in the science of transport engineering and formulate ways and means for such instruction in bringing out trained engineers, not only conversant with road-building but with the maintenance, routing and other details entering into successful transport. He emphasized the lack of a handbook and urged the formulation and tabulation of such information.

H. R. Cobleigh, secretary of the service division of the National Automobile Chamber of Commerce, declared the public up to this time had thought only of the established professions for the training of their children and had given too little thought to the automotive industry and its allied branches. He urged the possibility of going beyond the educators and getting to the heart of the public in the campaign of education along this line. Mr. Cobleigh told of the service department of the N. A. C. C., and said that it went back to the factory with the idea of training service executives, service managers, testers, stockmen and salesmen needing technical education. He declared it was impossible to train shopmen and said only a college training would suffice. The great dearth of service mechanics and shopmen, he said, was appalling and discouraging and the greatest hindrance to the industry.

Mr. Cobleigh declared the problem involved was taking care of cars and trucks after they have left the factory, emphasizing its importance equally with that of the design and construction of the vehicle. He said

the school that graduates a man in six to eight weeks does not fill the need but turns out a class of incompetents. In citing the size of the industry as showing the importance of the appeal for higher training, he declared there were 250 manufacturers of cars and trucks in America to-day. Figuring the life of a car at six years, he said a million a year must be built for replacement. "You can't get the men ready too quickly," Mr. Cobleigh said, addressing the educators.

O. T. Hillshafer, of the service committee of the N. A. C. C., said he was called upon every day to furnish men who could be relied upon to handle big trucks and delivery car fleets and supervise construction and maintenance of roadways but declared that he could not find them. The few who are reliable, he said, are busy, and those who are available cannot be recommended. He spoke of the unlimited opportunities offered and declared America must have college trained men to keep this great demand supplied.

A General Problem

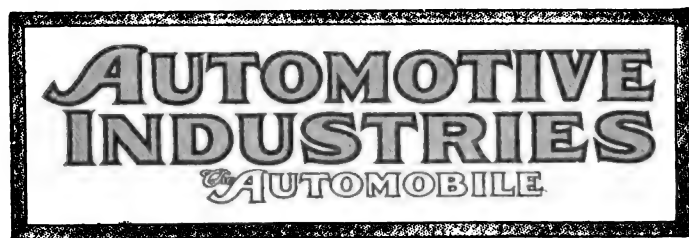
Mr. Chapin, at the beginning of the afternoon session, emphasized the fact that the automotive industry was a minor factor in the consideration of this great problem. He said that the general welfare of the country demands trained minds to deal with transport and traffic engineering and that it was not a question simply of training engineers and mechanics, but one which went back to the primary grades. He urged that men should be taught so as to be fitted for the particular type of industry they prefer to enter. In outlining the advantages offered, he said, managerial positions even to the advertising manager demanded a thorough knowledge of highway transport. He said the problem faced is one affecting the automotive field and the public generally.

Dr. Charles S. Howe, president of the Case School of Applied Science in Cleveland, declared the colleges were desirous of co-operating and helping in every way in their power in development of the movements suggested, but said they were handicapped by finances. "I would suggest that you take our students in vacation time, not with the idea of getting value received in service for the salaries you will pay them, but with the idea of training them for the big positions in your employ when they have developed into competent engineers," he suggested. "Give them practical work in different sections of the industry. You will get a line on their ability by the time they graduate and this will show you how capable they are for filling any want you may have. You cannot get men trained as you want them, unless you give them the benefit of practical experience to co-ordinate with our theoretical studies. It will be a great asset to you and, working together, I believe we can build the organization you need."

Independent of College Finances

Professor Blanchard suggested the selection of certain institutions scattered throughout the country with chairs of highway engineering, independent of college finances, and suggested that some of the industrial leaders, who talk freely in millions and billions, devote a part of their funds to building up the engineering profession. He urged arrangement of courses so that men may take advanced work in engineering during leaves of absence and told of the effort at the University of Michigan to concentrate highway engineering study into a two weeks' course devoted entirely to that subject.

The conference was followed by a meeting of the Detroit branch of the National Highway Traffic Association and the Board of Commerce at Detroit the same night, at which Horatio Earle urged road development and endorsed the suggestions made at the conference to-day.



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The Airplane Industry

SALES plans of the syndicate which recently purchased the surplus aeronautical stocks of the British Government have not been announced in detail. But from the information so far received in America it appears that a world-wide attempt will be made to market the 10,000 planes, the 35,000 engines and the immense supplies turned over for civilian disposal by the huge transaction. The United States most certainly will not be overlooked in the clean-up of these stocks, as several events have indicated.

"To establish beyond question the supremacy of British aircraft in the world's markets" is the announced intention of the interests involved in the transaction. What that means, in terms of low prices, of competition with domestic builders, and of possible injury to the already overburdened industry in the United States, can be imagined readily when the full scope of the plan is considered.

The buyers declare they intend to establish commercial aviation on a basis of "wise organization, sound finance and great prosperity." And, with-

out doubt, their concept includes the territorial limits of the United States.

But this country has an aeronautical industry which is, with all due respect to our Anglo-Saxon competitors, as capable and as skillful as any in the world. The American industry, unquestionably, is facing, as it has since the armistice, a slender hope of achieving a satisfactory financial basis on aircraft work. It can attain such a foundation only by the establishment and operation of commercial freight and passenger carrying lines.

Thus far, little capital has been invested in such enterprises. But the call for such investment—in American lines operating American planes with American personnel—at last has become urgent and deserves immediate attention.

The Need for Higher Education in Industry

IN this issue is printed the report of a meeting at Ann Arbor, Mich., at which was discussed the need for additional engineering courses in the universities to equip men to meet the transportation problems that have arisen with the development of the automotive vehicle. Especially is this true in connection with highway engineering.

The leaders in highway construction make no effort to hide the fact that the present engineers have not fully appreciated their problem and that the question of road construction must be entirely reopened. Roads that formerly were considered adequate for heavy transportation quickly "go to pieces" under the strain of truck and car traffic.

The university men with one voice say that they fully appreciate this situation but that they are handicapped by a shortage of money. They lack funds for the opening of special schools and lack money with which to pay their best professors enough to keep them from leaving the teaching tasks to join commercial staffs.

The question of roads is one of the big problems ahead of the automotive industry. Bad roads are a tremendous sales resistant. An investment in good roads is a direct sales investment. The manufacturer who endows a highway engineering chair in a university has made a definite investment for the future of the industry. To look at it another way, an endowment to provide good roads is that much invested in service.

Designing for the Export Market

A RECENT issue of the London *Times*, which has been much concerned with the "invasion of the English markets" by American car manufacturers, criticised the seating arrangements of one of the best known automobiles made in the United States. In this country, the machine is considered as one of the most luxurious and it is, without doubt, one of the costliest of the American models. But the *Times* considered it uncomfortable, although praising its other features.

In this same connection, an American exporter of automotive equipment found that the design of his product was not in keeping with the ideas of attractiveness and appearance demanded by his overseas purchasers. Consequently, the product was redesigned, polished up and given a better finish and the sales result has been reported as gratifying.

Discussing the English demands an export designer in New York declared recently that the British wanted a car in which they did not have to sit upright but in which they could lounge back in more comfort. The London paper has emphasized somewhat the same desires and has spoken at length of other American features that were claimed to be less finely finished or less ornate than on the corresponding British product.

The answer is hard to find, particularly in a market like the present, with demands high above the supply. But it is to be considered that the British and other foreign buyers know what they want. Consequently, it would seem that the American exporter should not forget this consideration when determining his model for overseas sale.

Chassis Lubrication

THERE is no other factor which equally affects the life of an automobile as lubrication of all wearing parts. In the engine efficient lubrication is absolutely essential and tolerably efficient systems were worked out in the earlier period of development. Chassis lubrication, on the other hand, was long neglected. In view of the fact that some of the chassis parts, like the spring bolts, are subjected to very high bearing pressures, their wear when unlubricated is very high. Some means for lubricating these parts has, of course, always been provided, even if nothing else than an uncovered oil-hole or a compression grease cup. The trouble is that if the oiling places are inaccessible, or if the job of renewing the supply of lubricant is onerous, the owner of the car will shirk it. In this respect the modern systems of engine lubrication are almost ideal. Everything is lubricated automatically and all the operator has to do is to periodically draw off the supply of stale oil and replace it with fresh oil. A circulation indicator or pressure gage keeps him constantly informed whether oil is being properly fed to the bearing surfaces, and an oil gage indicates to him the level of oil in the engine sump. Even the process of renewing the oil has been made as convenient as possible by placing the filler spouts in more accessible positions.

If the chassis lubricating system could be worked out in a similar way it would certainly be a great advance over our present methods. However, the difficulties in the way are easily realized. The engine is now a compact unit, completely enclosed, with all the bearings on the inside, while on the chassis the bearings are widely scattered. If the chassis bearings were to be lubricated from one or two central points, a great many pipe connections would be necessary, and such oil piping would be very objectionable, on account of the danger of breakage and of leakage

at joints. Even in engines we consider it quite an improvement if we can dispense with the comparatively short lengths of outside piping sometimes used to connect the pump with the sump and the distributing passage. The chances of leakage, etc., are, of course, much greater if connections have to be made to unsprung parts like the rear axle. It is quite obvious that this central supply chassis lubricating system is adaptable only to high-grade cars, because of the high grade of workmanship required to make the oil distributing system enduring. And in the case of the higher priced cars there is really less need for an automatic oiling system, because these are generally driven by chauffeurs who have plenty of time to look after the machine.

For the great bulk of moderate priced cars that are usually driven by their owners the solution of the chassis lubricating problem seems to lie in methods of individual supply so worked out as to require less frequent attention, to be more accessible and less messy. That much thought is being spent upon this problem, in the truck field, as well as in the passenger car line, is evidenced by the frequent references to improvements in lubrication in descriptions of new vehicles.

Taxes Heavy on Aviation

A CONSTRUCTIVE act for the development of commercial aviation by Congress would be the cancellation of all tax measures in so far as they may relate to aeronautics.

Recently several New York financiers, approached by ex-Army fliers, were favorably inclined toward extension of financial credit for an aerial transport company. Plans were made to purchase ground for a field and airplanes and other equipment, when it was discovered that State and Government taxes would be so great that the chances of earning money were slight as compared with the chances of losing it, and the project was abandoned.

France, though hard-pressed for funds and asking assistance from other countries, is shrewd and clever enough to realize the possibilities of the control of commercial aviation, and despite its needs, France has set aside 18,000,000 francs for the subsidization of airplane plants and pilots, to insure the development of French aviation.

Increasing Production

IN these days of labor difficulties and curtailed production it is refreshing to see a little sunshine through the rain. Reporting for thirty companies, which represent about 85 per cent of the total American output of steel engines, the American Iron and Steel Institute states that the production for the month of February was between eight and nine per cent more than that for the month of January. Estimating the total capacity of these plants at 15,000,000 tons, February showed a production efficiency rate of 89 per cent.

Insurance Rates

Show New Increases

Collision Rates Take Radical Jump, with Slight Increases on Other Points

NEW YORK, April 19—New insurance rates on automobiles for public liability, property damage and collision hazards prepared by the National Workmen's Compensation Bureau, became applicable to all new business April 15, and will apply to all renewals dating from June 1. Features of the new rates are a moderate increase for public liability on passenger cars, a substantial increase in public liability rates on commercial vehicles, and a radical increase in collision rates for all classes.

General rate increases will be found to be principally applied in the congested traffic territories. This amounts to about 10 per cent for passenger cars and approximately 35 per cent for commercial. The new rating continues the car valuation as the basis, but by establishing a key symbol for each make of car has obviated the defect in last year's system, which resulted in an advance in the premium rate every time the maker of a car advanced his selling price.

Collision rate advances are based on very unprofitable experience of all companies and while varying greatly according to the types of cars, on the whole amounts to at least 40 per cent over last year's rates. The property damage rates are based upon the inclusion of loss of use liability and are slightly less than last year's rates for the two hazards combined. Territories have been slightly modified but in general conform to last year's boundaries, with the important exception that a new intermediate territory between six and seven has been created.

Listings of Cars Changed

The Bureau in issuing the new manual gave a summary of some of the more important changes, in which it said:

"To eliminate the discrepancies in liability and property damage rates caused by variations in the list price of automobiles, it was decided this year to symbol all automobiles for liability and property damage. This will place the 1916 automobile and the 1920 automobile on the same basis and the rate for both will be alike. It is clear that the hazard for property damage and liability is similar for both cars and the rates should therefore be the same. It will be found that with few exceptions last year's liability and property damage rates for private passenger automobiles are continued.

"The collision experience collected this year showed a decided increase in loss ratio and made it necessary that all collision rates should be increased. It was also found that the proportion of losses for new cars was greater than for old cars. Three age classes have been established. New cars as defined in the manual are given the highest rates;

cars one year old as defined are given a lower rate and cars over one year old as defined are given a still lower one. It was also found that at the present time it costs just as much to repair a 1916 model as it does to repair a 1920, and for that reason collision rates for both models should be alike. To accomplish this all automobiles have been given symbols for collision insurance just as they are for liability and property damage.

3 Load Capacities for Trucks

"A very material change is made in rating commercial vehicles. The number of classifications as to business has been materially reduced. On the other hand the experience collected indicated that the proportion of losses increased as the load capacity increased and three load capacity classifications were established. The first is for trucks with load capacity of one ton or less and is called the light class; the second from more than one ton to 3½ tons inclusive is called the medium class, and the third or heavy class includes all trucks over 3½ ton capacity. This division of load capacity is not made for fire engines, police patrols and other similar emergency vehicles.

"Collision insurance for commercial vehicles provides no age distinction as is established for private passenger cars. As with passenger cars, commercial vehicles have also been symbolized for collision insurance. However, as most of the prices for commercial cars cover only the chassis, a separate table of symbols has been prepared for the complete car—chassis, body and additional equipment. A special rate slightly lower than the regular classification was established for farmer's trucks and a special indorsement prepared to be used in connection with such rates. Farmers' trucks, however, should not be confused with farm tractors, which also have a special rate.

"The eligibility requirements for experience rating have been somewhat lowered as respects the number of automobiles. No distinction is made between private passenger automobile fleets and commercial automobile fleets. It should however be noted that all automobiles to be eligible must be strictly under one ownership and under one operating management, and the experience for automobiles of officers, salesmen or other employees cannot be included, nor can the rate produced by such experience be applied to these automobiles."

EXTEND TIME ON TRAILER TAX

WASHINGTON, April 16—The Treasury Department has directed the Internal Revenue collector to advise all manufacturers of their liability to tax on all sales of semi-trailers on and after Feb. 25, 1919, and to collect the tax due the Government. Because of the fact that there was a general misunderstanding regarding the taxability of semi-trailers they have been granted an extension of time until June 20, next, in which to make returns and pay the tax due prior to April 1, last.

Propose Seasonal Licenses in England

Would Supplant Yearly Tax with Quarterly or Semi-annual Permit

LONDON March 30 (*Special Correspondence*)—The Committee appointed by the Ministry of Transport last November to consider the question of the taxation of road vehicles is on the eve of presenting its report.

The Committee will propose sweeping changes in the present scale of licenses for motor vehicles. It is understood that the Committee will recommend that private motor-cars shall bear a tax of £1 for every unit of horse-power. The present scale begins at two guineas for cars not exceeding 6½ horse-power; rises by easy stages to £21 for cars between 40 and 60 horse-power, and ends at £42 for cars exceeding 60 horse-power.

The Committee propose that commercial motor-vehicles shall be taxed according to their unladen weight. They recommend that the tax shall be £16 on such vehicles not exceeding one ton, £21 between one and two tons, and £30 over four tons.

The Committee recommend that the present system of annual licenses should be abandoned in favor of quarterly, half-yearly, and yearly licenses, whichever motor users elect to take out. It is thought that this option will afford some measure of relief by enabling motor users to escape taxation during the bad weather season in which their cars are in the garage.

MAXWELL TO BUILD BODIES

DAYTON, April 16—Announcement is made by Bruce Ott, manager of the Maxwell plant here, that the Dayton factory will be used for the manufacture of bodies. In addition to manufacturing them for Maxwell cars it will produce about half of those used for Chalmers cars. The Leo Street Maxwell plant will be reopened and employment given to about 600 more workmen. The transfer of body work to this plant, which formerly was used for the manufacture of axles, will permit the use of the Third Street plant for closed bodies exclusively.

BAKER R & L GETS CITATION

CLEVELAND, April 16—The Baker R & L Co., manufacturer of Baker electric industrial tractors and trucks, has received official notification of citation by the United States War Department for "special effort in rendering valuable service by prompt execution of orders and intelligent co-operation." The citation is given on the recommendation of the chief of construction division and the notice of citation is signed by Major General George W. Burr, Assistant Chief of Staff, director of purchase, storage and traffic.

G. M. C. Sales Total \$509,676,694 in 1919

President Durant, in Annual Report, Outlines Divisional Growth of Company

NEW YORK, April 16—A tremendous increase in the earnings of the General Motors Corp. was announced by W. C. Durant, president, in his annual report to the stockholders made public to-day. Net profits for 1919, after deducting all expenses of manufacturing, selling and administration, ordinary taxes, depreciation, employees' bonus stock, employees' investment fund and allowances to employees on bonuses, amounted to \$90,517,519, compared with \$35,504,376 in 1918. Federal taxes and extraordinary expenditures absorbed \$30,000,000, leaving a balance available for preferred and debenture dividends of \$60,517,519, an increase of \$45,126,491.

The 1919 surplus, after all charges, including dividends on the preferred and debenture stock, was \$55,792,972, equal to \$36.35 a share on the \$153,411,000 common stock outstanding, compared with approximately \$9 a share earned on \$147,379,900 common stock in 1918.

Net sales of the corporation and its subsidiary companies for the year were \$509,676,694, against \$326,044,756 in 1918, an increase of \$183,631,938, or 56.3 per cent. The number of passenger cars, trucks and tractors sold was 406,158, compared with 246,834 the preceding year, an increase of 64.5 per cent.

Working Capital, \$158,754,500

Net working capital of the corporation, as disclosed by the balance sheet of December 31, 1919, amounted to \$158,754,500. Total current assets were \$215,824,785 contrasted with current liabilities of \$56,180,402. Notes payable of \$6,812,318, the report said, represented \$4,074,118 borrowed by subsidiary companies, and the balance of \$2,738,200 covered miscellaneous indebtedness assumed by the company in the purchase of properties.

Other indebtedness of the company at the close of the year consisted of current accounts payable of \$37,846,313 and \$11,521,770 liabilities accrued but not due, for payrolls, ordinary taxes, etc.

"While it will be seen from the above," says Mr. Durant, "that the net working capital has been increased during the year by \$3,852,472, attention is called to the fact that the increase in net working capital, exclusive of United States government bonds, amounted to \$37,491,271. The amount, \$28,852,018, invested in United States government bonds in 1918 and temporarily carried in working capital, was converted during 1919 into cash and the proceeds used for new construction, as was intended."

Looking into the future, Mr. Durant said: "There is no diminution in the demand for your product, the number of passenger cars, trucks and tractors sold for the first quarter of 1920 to

March 31 being \$119,779, as compared with \$82,456 for the corresponding period of the previous year, an increase of 45.2 per cent. The net profits for this period, before deducting Federal taxes, are estimated at upward of \$26,500,000."

The payroll of the company for 1919 totaled \$104,380,000. The number of employees in its service at the end of the year was 85,980, compared with 49,118 at the close of the year preceding. The number of stockholders, the report said, is in excess of 24,100, of whom 6,650 are employees.

In discussing the expansion of the corporation, President Durant said:

Buick Production 500 Daily

"Expansion of manufacturing facilities at the plants, which was necessarily interrupted during the war, has been resumed. During the year the capacity of the Buick division was increased from a production of 350 passenger cars a day in January, to 500 a day during the last quarter. Construction now under way at Flint and St. Louis will bring total productive capacity for Buick cars to more than 700 a day. Capital expenditure on this division during 1919 was \$5,018,660.

"Construction was started on a new factory for the Cadillac division early in 1919. Rapid progress is being made on this plant, which will embody the very latest ideas for economical manufacture, and when completed this factory will have a capacity of approximately 30,000 passenger cars per annum. New construction by this division required \$4,937,160 during the year.

"During 1919 the productive capacity of the Chevrolet plants at Flint, Tarrytown, Fort Worth, and St. Louis was increased to 800 cars and trucks a day; additional construction under way will, when completed, permit the production of 900 passenger cars and 50 trucks a day. Capital expenditures of this division during the year required \$7,420,460.

"Rearrangement of the Pontiac plant of General Motors Truck division, and additions to present buildings, will permit the production of 20,000 trucks per annum. Congestion at the Pontiac plant will be largely relieved by the establishment of an assembly plant in eastern territory during 1920.

Oakland to Make 350 a Day

"With the completion of new construction started in 1919, the capacity of the Oakland division will be increased to 350 passenger cars a day.

"At a cost of \$2,552,090, the capacity of the Olds Motor Works was increased to 300 passenger cars and trucks a day.

"The Scripps-Booth division in its new factory will be able to produce 100 cars a day.

"New facilities, which are practically complete, will give the Samson Tractor division a capacity for turning out 100,000 tractors a year.

"The corporation was fortunate in assuring an enlarged supply of bodies through the acquisition of a majority interest in the Fisher Body Corp."

Service Managers To Study Systems

Factory Representatives to Meet in Indianapolis Under N. A. C. C. Auspices

NEW YORK, April 16—Factory service managers from all parts of the country will hold a convention at Indianapolis May 24, 25 and 26. The convention will be under the direction of the Service Committee of the National Automobile Chamber of Commerce, and is intended as a follow-up to the Service Convention which was held last November in Detroit.

These service conventions are not a new departure for the Chamber, but rather the taking up of the reins where they were laid down at the time this country went to war. Several were held some years ago, but the Detroit meeting marks the first of the post-war conventions. As a starter, the first one necessarily dealt with service in a very broad and general way, covering so many phases of the subject that not very much could be done on any one thing. But it started the ball rolling and now the second post-war convention will get down to brass tacks. Boiling the activities of the subjects down to a single sentence, the effort will be "To get a better conception of service on the part of all parties concerned."

The first two days of the convention will be devoted to the reading and discussion of a number of papers, the first day's subjects being "Service considered from outside the service department." The following day the talk will turn to "Service considered from inside the service department." Titles of some of the papers will be, "Salesman's responsibilities in connection with service," "Owner's responsibilities in connection with service," "Methods of estimating charges for service," "Repairshop efficiency methods," "Stockroom efficiency and sales methods."

It is probable that there will be some talk about the new service division of the N. A. C. C.

Al Reeves will be chairman of the daily sessions, and L. C. Voyles, Service Manager of the Nordyke & Marmon Co., and President of the Automotive Service Association of Indiana, will be in charge of the trips on the third day.

The Service Committee consists of E. T. Herbig (Service), chairman; H. W. Drew (Packard); W. M. Ladd (Pierce-Arrow); A. B. Cumner (Auto-car); W. M. Britton (Republic); O. T. Hillshafer (Chandler); W. B. Riley (Jordan).

OLDFIELD ENTERS SPECIAL

INDIANAPOLIS, April 16—Barney Oldfield has entered an "Oldfield Special" of 182 cu. in. piston displacement, for the sweepstakes Memorial Day. The car was put together by Harry Miller of Los Angeles. Oldfield has not announced who will drive it.

Hub Standardization Manufacturers' Aim Wheel, Bearing and Axle Makers' Convention Planned to Settle Problems

BUFFALO, N. Y., April 16—A combined meeting of manufacturers interested in the standardizing of truck hubs will be held at Atlantic City, June 7, if the plans of the Automotive Metal Wheel Association carry out. Such a decision was reached at a special meeting of the association held here this week, when the various problems in connection with further standardization of truck hubs were analyzed.

The association is issuing an invitation to the members of the Automotive Wood Wheel Manufacturers' Association, which has been active on this phase of truck standardization and has had a special engineering research conducted in connection with it for some time. Others invited will include the manufacturers of axles for motor trucks, as they are naturally interested in hub standardization; and also those truck manufacturers producing their own axles.

The bearing manufacturers are concerned in this standardization work in that different bearing sizes call for different machining operations and interfere with axle standardization. The meeting should bring together upwards of a hundred manufacturers representing these various lines, and all of whom are interested in standardization work. It is possible that tire and rim manufacturers may also participate in the meeting.

To-day's meeting served to bring to the surface many of the standardization problems in hub and wheel construction which are holding back production and increasing the cost of such parts. No time is more opportune than the present to carry out this standardization work in that metal wheel manufacturers, wood wheel manufacturers, and axle makers are studying the problem of the pneumatic tire and redesigning their apparatus to meet pneumatic tire requirements.

Outline Points of Variance

Some of the wheel manufacturers want the rim makers to standardize on the distance between the bevel surfaces which support demountable rim on the wheel felloe. The distance between these surfaces is different on different rim sizes which calls for different manufacturing fixtures.

There is necessity for some agreement on what is known as "the bolt circle diameter," which refers to the transverse bolts passing through the felloe to secure the demountable rim in position. With the pneumatic tire but one wheel diameter is used, but there is a difference in the diameter of this bolt circle which calls for different jigs, etc., by the manufacturer. The difference is so slight that many of the makers think it could be eliminated.

It is matters of this character that, as one wheel maker put it, call for manufacturing over a hundred different models of wheel hubs, and necessitates an investment of \$500,000 in special jigs, tools, and other equipment.

There was a great deal of discussion because there seems to be no specific ruling as to the spacing between the bearing in the front wheels of a motor truck. Instances were cited of a 2½-ton truck which had the bearings spaced 3½ inches apart, whereas on a 3-ton truck they were spaced 3 inches apart. Naturally the spacing distances of the bearings call for corresponding machining in the hub. If there were some uniform spacing distances it would facilitate the work of the wheel maker.

Atlas Takes Over M.-P. Truck Interests

NEW YORK, April 16—Stockholders of the Martin-Parry Corp. have ratified the proposal of the directors for the sale for cash of all assets of the company engaged in the manufacture of trucks to a new company to be known as the Atlas Truck Corp., headed by J. P. Watson, Jr., present chairman of the board of the Martin-Parry Corp.

Stockholders were informed they would have the privilege of subscribing to 25,000 shares of the new corporation at \$5 a share and to 35,000 shares at \$17 a share which is the price the syndicate of underwriters guarantees.

The officers explained that the reason for selling the truck business is that they were encountering trouble with rival truck makers who are customers for truck bodies which is the main business of the company.

The new corporation has been incorporated in Delaware with a capital of \$15,000,000.

TO BUILD AXLE BRANCH

WEST BEND, WIS., April 19—The American Axle Co., of Chicago, an Illinois corporation with \$500,000 capital, and manufacturing worm-drive axles for passenger and commercial cars, has decided to establish a branch plant in Barton, a village near West Bend, Wis. Work will start at once on the erection of a one-story shop.

G. M. C. LOCATES ENGINEERS

DAYTON, OHIO, April 16—All research and engineering laboratory work of the General Motors Corp. will be centralized at the plant of the Dayton-Wright Airplane Co. here. About 1600 laboratory men, chemical and physical engineers, etc., will be employed.

SIMMS TO DOUBLE OUTPUT

EAST ORANGE, N. J., April 16—The Simms Magneto Co. has begun construction of an addition to its plant which will permit an increase of more than 100 per cent in production. When the work is completed in August it will permit a daily production of from 1300 to 1500 magnetos a day.

Day-Elder Loses Suit to Sales Head Court Decides Manager Not Limited in Choice of Sales Headquarters

NEWARK, N. J., April 16—A decision adverse to the Day-Elder Motors Corp., in its contract suit against Percy K. Hexter has been handed down in Chancery Court by Vice Chancellor Fielder who upholds all the contentions of the defendant. The company announces that it will appeal to the Court of Errors and Appeals.

The suit was the outgrowth of a contract entered into between the corporation and Hexter on Dec. 26, 1916. The agreement provided that Hexter was to serve as sales manager for three years with the stipulation that it should be renewed under certain conditions.

As sales manager, Hexter was to receive 5% commission of the list price of all motor truck chassis sold. If he sold 1,400 in the first three year period it was to be renewed for five years upon the same terms and if he sold 4,000 chassis in that time it was to be renewed for another five years. It was further agreed that the Day-Elder Corp. should deliver to Hexter 5,000 shares of its stock which would become his unconditionally if he fulfilled all the conditions imposed. If he sold 1,400 chassis in three years a proportionate part was to be his absolutely and if he sold 4,000 in five years a larger proportionate part was to be his and if 10,000 were disposed of in thirteen years he was to be the owner of all of it.

In Sept. 1918, Hexter decided to enter the military service and a supplemental contract was made which provided that the company was to take over the sales organization and pay all its expenses until he returned. When Hexter went to war, the sales force was moved from New York to the factory at Irvington. When Hexter was discharged from service, the corporation insisted he should direct sales from Irvington while he wished to open his office in New York. When he persisted in his refusal to comply with the company's directions in this respect he was discharged.

Had Only to Complete Sales

The Day-Elder company alleged breach of contract and sought the recovery of the 5,000 shares of stock. Chancellor Fielder holds that the contract did not specifically give the company the right to dictate where the sales headquarters should be located and that it was Hexter's privilege to have his offices wherever he pleased so long as he carried out the selling end of his contract. He was not bound to devote all his time to the Day-Elder Corp., but was required only to sell a certain number of chassis. In two years he sold all that was required for three years.

The court finds that the contract provided that if Hexter should cease to be employed, without any fault of his own, the stock should be his property.

Canada Enrolls New Air Militia Camp Borden Taken Over for \$5,000,000 to Train New Forces of Dominion

OTTAWA, April 16—Applications are coming in at the offices of the Air Board at the rate of fifty and sixty a day for enlistment in the new Canadian Air Force. All the applications are from ex-officers in the Royal Air Force.

Preparations are already under way at Camp Borden, western Ontario, for the establishment of the first training camp of the force. Officers of the new force will train at Camp Borden in periods of a month or so at a time. There are adequate facilities there for the training of nearly three thousand men at a time. The equipment installed by the Royal Air Force at Camp Borden has been taken over by the Canadian Government for the use of the Canadian Force, including eighteen hangars and substantial permanent buildings.

The building of this flying base cost the Imperial Government \$5,000,000, and comprises an up-to-date airdrome and barracks. It is only a few days since it was announced by the Federal Government that a Canadian air force was to be formed immediately.

The personnel will be drawn from volunteers from the ranks of ex-officers and airmen of the Royal Air Force resident in Canada. These will train at centers, which will be in operation all the year round, and officers and airmen enlisted in the new force will spend at least one month out of every twenty-four in active training, receiving pay and traveling expenses during their active period.

The force probably will be limited in the beginning to about five thousand, inclusive of all ranks, and the training centers will not number more than one or two to begin with for the whole Dominion. It is understood that the government wishes to avoid an expensive permanent organization. The organization of the force will be placed in the hands of Canadians who have had experience at home and on the war fronts in flying, and who are interested in building up a Canadian air militia, which can readily be extended and mobilized in an emergency. Age limit is set at about 30 for junior officers, and 38 for senior officers.

Applications for enrollment in the new air force, giving all particulars of previous service, may be sent at once to the secretary of the air board at Ottawa.

Volunteer provincial executive committees of seven, acting without remuneration, will administer the force by provinces.

UPHOLD WOVEN TIRE PATENT

TRENTON, N. J., April 16—The United Circuit Court of Appeals at Cincinnati has affirmed the decision of the District Court granting the de Laski

& Thropp Circular Woven Tire Co. of this city an injunction restraining the Miller Rubber Co. of Akron from infringing a patent which was held valid. The court ordered an accounting of profits and damages against the Miller company, and this has been settled.

In a similar suit brought against the Empire Tire & Rubber Co. of Trenton the United States Court in New Jersey also found in favor of de Laski & Thropp and a master awarded them more than \$20,000 in damages.

General Motors Buys Doylestown (Pa.) Plant

NEW YORK, April 17—General Motors Corp. has purchased the Doylestown Agriculture Works at Doylestown, Pa. It expects to erect there within two years a \$1,000,000 plant for the manufacture of automobiles and farm machinery. The new plant, in which 2,000 persons will be employed, will be built along the Doylestown branch of the Philadelphia & Reading Railroad. Options have been obtained on numerous tracts.

General Motors will continue the manufacture of farm machinery for export at the present plant.

MARMON GETS CITATION

INDIANAPOLIS, April 16—The Nordyke & Marmon Co. has been cited by the War Department for distinguished service, energy and efficiency in turning out engines for training planes and Liberty motors.

Firestone Expend Million in Straits Economy in Rubber Handling Planned to Offset Raw Material Costs

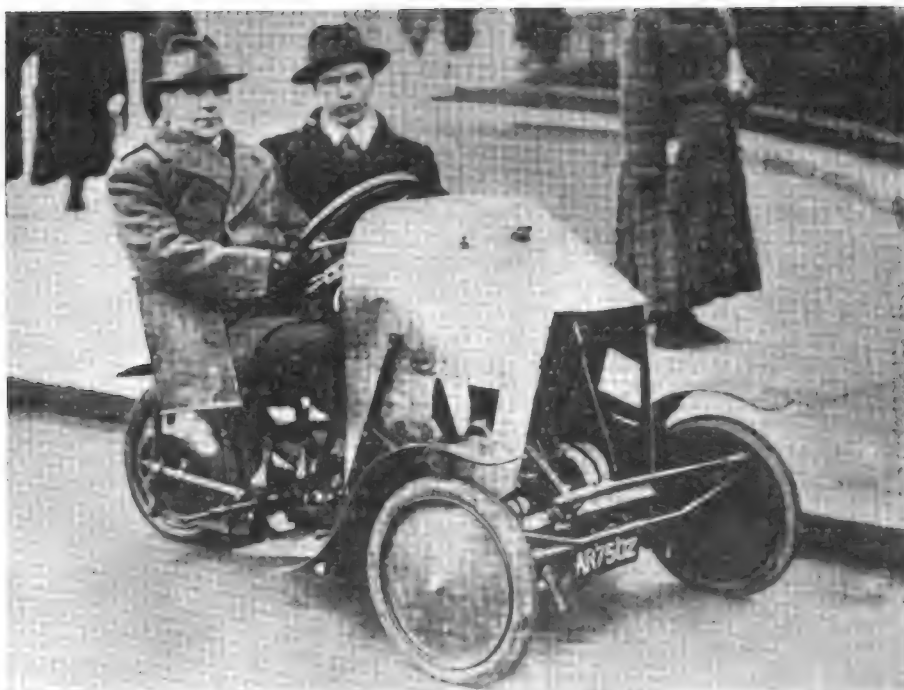
AKRON, April 16—The Firestone Tire & Rubber Co. announces that its main purpose in erecting its \$1,000,000 plant at Singapore, Straits Settlements, is to offset mounting costs of raw materials, especially cotton for fabric. The machinery which is being shipped to the Far East is designed to replace time consuming methods of handling crude rubber. The saving is expected to amount to hundreds of thousands of dollars annually.

The plant will clean and compress the rubber in such manner that it will occupy less space aboard ship, thereby saving on freight charges. The cleaning process, carried on by coolie-operated machines, will also effect a saving in that it will permit the rubber to go to the skilled hand of the mill operator immediately upon its arrival in Akron.

The plant will effect a further saving by making it possible to sidestep numerous middlemen. According to S. G. Carkhuff, secretary of the company, who returned to the United States recently from Singapore, it will be the only factory of its kind owned and operated by a rubber tire company.

Firestone crude rubber requirements will demand the productive efforts of 100,000 persons throughout the year, even after the plant is in operation.

This Is a "Tankette," London's Latest



Not built for looks, just for service, is the way the latest thing in miniature automobiles is described. There is room for two passengers, and it manages to get to its destination safely and in fast time

Foreign Trade Bank Formed in New York

First Federal Banking Association Notifies Manufacturers of Exchange Policies

NEW YORK, April 16—A preliminary permit for organization has been granted by the Federal Reserve Board to the First Federal Banking Association, the first organization to apply for a charter under the provisions of the Edge bill. It is expected the bank will be ready for business by June 1.

The new organization will have a capital of \$2,100,000 and the stock has all been underwritten at \$105 a share. None will be offered to the public. The banks which are associated in obtaining the charter are: Aldred & Co., Bank of the Manhattan Co., New York Trust Co., Liberty National Bank, Tucker, Anthony & Co., of New York; Citizens Commercial Trust Co., Buffalo; American Trust Co., Boston; Merchants National Bank, Worcester; Chicopee National Bank, Springfield, Mass.; Commercial Trust Co., Philadelphia, and First Bridgeport National Bank, Bridgeport, Conn.

W. S. Kies of Aldred & Co., formerly vice-president of the National City Bank and the American International Corp., will be chairman of the board. With him will be associated J. H. Perkins, former executive manager of the National City Bank.

A statement issued by Kies explains that banking associations organized under the Edge bill may do a general international banking business, deal in exchange and provide the various facilities needed in foreign commerce. Under the law liabilities in the form of acceptances and other obligations may be issued to the extent of ten times the capital and surplus.

Letters have been sent to manufacturers interested in foreign trade in which it is asserted that if American manufacturers are to continue doing business in other countries they must absorb the exchange loss, increase prices or extend credits. It is explained that the new bank will be able not only to extend credit but to loan capital to extend foreign trade.

LIFT PARCEL POST BANS

WASHINGTON, April 16—The Post-office Department announces that restrictions have been removed on shipment by parcel post to Great Britain and Ireland of the principal and accessory parts of automobiles, and motorcycles except pneumatic tires.

S. A. E. TO MEET IN GAMES

NEW YORK, April 18—Members of the Society of Automotive Engineers will be given an opportunity to demonstrate their prowess in a series of games which will be conducted during the summer meeting at Ottawa Beach in June. As an incentive to the utmost effort along

this line and as an antidote to the mental effort which will be required at the business sessions, prizes will be offered for the most creditable performances. To provide the funds companies represented in the membership will be permitted to contribute not more than \$25 each. On the program will be baseball, golf, tennis, water sports and field events. Prizes will also be awarded to the women who win at golf, tennis, croquet, whist and five hundred.

Applications for rooms at the summer meeting already received at headquarters here number 178. Included in the early applications for accommodations are 41 women.

Michigan University to Repeat Courses

DETROIT, April 17—During 1920-1921, the University of Michigan will offer twelve graduate, short period courses in highway engineering, and six in highway transport. Each course consists of thirty lectures to be given in a period of two weeks during the months of December to March, inclusive. Arthur H. Blanchard is professor in charge of this work.

A highway laboratory has been established, being equipped for the testing of stone, gravel, brick, cement and bituminous material. In order to make the laboratory of the greatest possible use in the development of the State highways, plans have been perfected for the testing of road making and paving materials intended for public use in Michigan, without any charge other than the expense in shipping samples. The University fee for each of the courses will be \$10.

BUYERS PROPOSE CONVENTION

NEW YORK, April 16—Members of the National Automobile Chamber of Commerce have been asked to indicate whether they believe a convention of purchasing agents would be productive of good results. It has been suggested that such a meeting be held at some centrally located city in May or early June to consider some of the most pressing problems which confront purchasing agents of automobile plants.

LADISH FORGE EXPANDS

MILWAUKEE, April 19—The Ladish Drop Forge Co., of Cudahy, a suburb of Milwaukee, has increased its capital stock from \$300,000 to \$700,000 and will further increase its facilities. It manufactures a wide range of automotive parts and is one of the pioneer drop forge shops in the Milwaukee district.

SEEKS TAX REVISION

SOUTH BEND, IND., April 16—A. R. Erskine, president of the Studebaker Corp. has written a letter to J. W. Fordney, chairman of the House ways and means committee in which he makes an appeal to Congress to revise tax legislation. Especially those sections relating to excess profits, the surtax of income and the tax on mortgages.

Indiana Factories Hard Hit by Strike

Shortage of Fuel and Materials Forces Suspensions at Indianapolis Plants

INDIANAPOLIS, April 22—If the outlaw switchmen's strike is not settled by the end of the week, Indianapolis motor car and equipment makers will face the necessity of shutting down, either next week or a few days later. Conditions in local railroad yards are not so bad, but the local factories are carrying the weight of shipping conditions in other centers.

George M. Dickson, of the National Motor Vehicle Corp., said his plant would be forced to close probably next Monday if relief is not afforded. However, at the Nordyke & Marmon plant, while conditions are serious enough, it is said that they have enough material to supply their needs for two or three weeks. The Weidely Motors company will be able to operate four or five days more, according to President George Weidely. J. J. Cole, of the Cole Motor Co., said to-day that his factory could operate one week longer.

Unless relief is given within the next few days, a shut-down of the LaFayette Motors Co. is imperative, according to M. J. Moore, treasurer of that company. Lack of materials and parts is seriously interrupting work there. At the Stutz Motor plant it was said that supplies were had sufficient to run the rest of the week, but that it was doubtful if operations could be started next week unless shipping conditions are ameliorated. The Cole Motor Co. hauled a supply of motors from Detroit, which it would not have been able to transport by rail for some time.

Improvements are noted in the coal situation for Indianapolis, a number of cars destined for Chicago and other centers having been diverted to yards here. The Merchants Heat and Light Co. and the Indianapolis Light and Heat Co. are in no immediate danger of a complete shut-down from a coal shortage.

First Suspension in Five Years

The Maxwell plant at Newcastle, Ind., after working on a half-day schedule, suspended operations yesterday, throwing 3,000 people out of employment. The factory, because of the strike, is unable to get raw materials and no more finished products. The factory has plenty of coal. This is the first time in more than five years that the factory has been entirely idle.

At Muncie, it was said, that unless the strike is ended, 5,000 men in the Muncie factories will be thrown out of employment. No switchmen are out at Muncie. The Muncie plant of the Indiana General Service Co. supplies several factories in Hartford City, Marion and smaller towns near, and may be compelled to shut off service to these plants to conserve coal.

Trucks Avert Food Crisis in Strike

**Hundreds of Carloads of Supplies
Are Brought to New York
Over Roads**

NEW YORK, April 19—Virtually complete paralysis of railroad freight transportation in the metropolitan district as the result of the "rump" railroad strike has centered attention more than ever before upon the motor truck and it has been used to a greater extent in short haul distribution of foodstuffs. As a consequence large distributors of produce have decided to carry on their trucks hereafter a considerable part of their wares which hitherto has come in by rail.

Hundreds of carloads of perishables stalled in nearby New Jersey cities and at other points within a radius of fifty miles have been unloaded on trucks and brought to the city without difficulty. Fresh shad was shipped by truck from Baltimore and other fish from Portland, Me. The contents of forty cars loaded with fresh meat were brought in from Port Jervis, 90 miles away, and great quantities of farm produce from Long Island.

Many fleets of trucks were organized to bring in foodstuffs and vegetables from Baltimore, Boston, Washington, Camden and other points. A carload of California asparagus was transported from Tarrytown in the same way. New England makers of boots, shoes and rubber footwear used trucks to transport this merchandise from Boston to New York, making the trip in about 24 hours.

Another result of the strike was the charting of complete plans for feeding the city by truck in the event of a real emergency. The three agencies which co-operated in making these plans were the Council of National Defense, the Motor Transport Corps of the Army and the Motor Truck Association of America. Provision was made to cover the entire Department of the East.

Strike Booms Truck Movement

AKRON, OHIO, April 20—Information received from all parts of the country at the Firestone Ship-by-Truck Bureau here shows that the "outlaw" switchmen's strike gave tremendous impetus to the movement as well as a practical demonstration of its possibilities. There was scarcely a good sized city in the country which did not fall back upon trucks for the transportation of food and other necessities.

Chicago, the first city hard hit, was the first to call upon the trucks for aid. The big packing houses kept fleets moving with shipments not only to all parts of the city but to other places as well. Morris & Co. kept fifty trucks in operation day and night supplying Racine, Elgin, Gary, Waukegan and Kenosha.

Cleveland, Toledo and St. Louis cleared thousands of tons of freight by trucks. In the larger places operations were under the direction of the Chamber of Commerce. Other cities which

used trucks effectively were Philadelphia, Boston, Albany, Hartford, Scranton, Harrisburg and Newark.

The Firestone company sent fleets of trucks to the East to deliver tires and brought them back loaded with cotton fabric and other supplies from the mills in New Jersey and New England. It also sent two truck loads of tires to the Yellow Taxicab Co. in Chicago, so it would not have to limit its operations because of lack of equipment.

Bay State Companies Adopt Truck Shipping

HOLYOKE, MASS., April 17—Direct auto truck shipping service between this city and New York is being worked out by several of the largest manufacturing concerns as a result of unsatisfactory service for months past. As a result of experiments reported as highly satisfactory during the past week, it is considered likely the service will be made permanent and taken up by other concerns.

William Skinner & Sons, silk manufacturers, are now shipping entirely by truck; the American Thread Co. is maintaining a truck line between this city, its plant at Willimantic, and its New York headquarters; the Germania Mills Co. recently placed a large van in commission between this city and New York and long distance shipping is also being taken up by the National Book Co., which is operating its own machines.

Joseph A. Skinner of William Skinner & Sons, is so satisfied that a third truck has been placed in commission. Three days is allowed for each trip, two trips a week being made. Trucks get an early morning start from the local plants, put up for the night at New Rochelle, N. Y., and are unloaded at the New York headquarters the following morning. Freight is brought back on the return trip.

SHIP CARS BY BARGE LINE

ST. LOUIS, April 19—Between St. Louis and New Orleans is a government-controlled barge line, and freight is being moved by the barges for through shipment to New York and the Atlantic coast and to South and Central America and to the Pacific coast and the Orient via the Panama Canal.

This service is being used by the Moon Motor Car Co., which is boxing motor cars in its factory in St. Louis, loading them on the barge line and shipping them direct to South American points.

The General Motors Co. also are expected to take advantage of the line.

AVERY TO BUILD TRUCK

PEORIA, ILL., April 17—The Avery Co. has made arrangements to add a one ton truck to its output of tractors and tractor and belt drawn machinery. Production probably will be started late this year. The truck will be designed especially to meet the needs of farmers and industrial firms. The trucks will be built in the plant of the Bartholomew Co. at Peoria Heights.

Patent Expiration Opens Chain Market

**American Chain Co. Says Exclusive Weed Features Will
Be Protected**

NEW YORK, April 20—Life of the famous patent of Harry Parsons, known technically as No. 723,299, under which the Weed tire chains have been made for seventeen years, expired on March 24. Predictions of what will happen in the chain market as a consequence are unsafe. The American Chain Co., which succeeded the Weed Tire Chain Co., and purchased the Weed holdings several years ago, declined to-day to go into details as to its plans in this respect.

"In addition to the Parsons patent we own the Weed patent, No. 768,495, which covers a special form of tire chain which we and our predecessors, the Weed Tire Chain Co., have marketed since 1904 under the trade brands of Weed and Rid-O-Skid," said a representative of the company to-day.

He added that the Weed patent is superior to the Parsons and that it was not believed any serious inroads could be made in the company's business on the earlier patent but that "exclusive rights" would be protected in the courts if necessary.

It was explained that the original Parsons patent covered a chain put on in zig-zag fashion but that of Weed is one which goes straight across the tire.

The American Chain Co. pointed out that the making of tire chains is now only a small part of its business. It has factories at Bridgeport, Conn., York, Pa., Braddock, Pa., Columbus, St. Mary's and Mansfield, Ohio, Marion, Ind., and Norfolk, Va., in addition to the plant of the Dominion Chain Co. at Niagara Falls, Ont. It recently took over the plants of the Page Steel & Wire Co. at Adrian, Mich., and Monessen, Pa.

The chains of all kinds made by the company would aggregate in length 450 miles a day if placed end on end.

When the American company first took over the Parsons patent it paid a royalty to Weed but later purchased his holdings. He has not lost interest in the company, however, for early this month his son, Robert Weed, was married to Miss Martha Lasher, daughter of President W. B. Lasher of the chain company.

ALLIS-CHALMERS ADDS TO PLANT

MILWAUKEE, April 19—As part of a vast enlargement of its main works in West Allis, a suburb, to facilitate the development of its tractor business, the Allis-Chalmers Mfg. Co., Milwaukee, has started work on a new gray iron shop, 135 x 557 ft., which will be used exclusively for the tractor division. The design of the shop embraces some unusual features which are meant to make the foundry and its service to the machine and assembling shops a model of efficiency and economy in producing and handling materials and finished castings.

Vickers Experiments With Transmission

Janney - Williams Hydraulic
Mechanism May Be Adapted
for Use on Cars

LONDON, March 23 (*Special Correspondence*)—It is reported that the Crayford Works (near Erith) of the Vickers Co., are experimenting with the Janney-Williams hydraulic mechanism as a possible transmission for vehicles. This transmission, which is of American origin and has been used in marine steering gears, has been discussed for some years in British engineering circles, and papers have been read on it before the technical bodies.

Nothing, however, had been done with it in the practical sense before the war, and doubtless the partial success of the Compeyne hydraulic system as applied to ships' rudders, and more recently to certain forms of power hoists, is responsible for the present revived interest. That attempts to evolve an hydraulic variable transmission have not been lacking here is shown by a list of these systems tried and for the most part found lacking.

There was a rumor before the war that the Manly (American) hydraulic transmission was to be developed in Great Britain for Europe. About that time Dr. Hele-Shaw, who is interested in the Compeyne transmission, had a truck fitted with that system, the motors being direct coupled to the rear driving wheels.

INDIA MARKET EXPANDS

DETROIT, April 17—Ford Motor Co. of Canada in the last seven months has shipped close to 5000 cars to India, more than treble the number shipped in the year ending Aug. 31, 1919. Rough travel-

ing in India is reflected in the frequent renewals of parts orders. One order received this week at the factory in Windsor called for many thousand dollars' worth of parts, the single order being sufficient to fill a good-sized ship.

All of the Ford cars shipped to India are built in the Canadian plant at Windsor, this plant supplying every country under British rule, save the British Isles, which is supplied from the factory in Manchester. In the Calcutta office of Ford Motor Co. there were said to be 2000 orders on file for cars, fulfillment of which was impossible because of lack of production and facilities for delivering.

LEARD FACILITIES ENLARGED

NEW YORK, April 19—Additional and heavier equipment has been installed in the plant of the William Leard Co., at New Brighton, Pa., for rough turning and grinding crankshafts up to 96 in. in length and also additional equipment for finishing connecting rods up to 600 or 800 lbs. in weight. This company has recently been handling a considerable amount of crankshaft work for marine engine manufacturers and states that indications are better for large volume marine engine production than they have been for some time. Of the work now going through this plant a larger percentage is for marine engines than has been usual in the past.

FEDERAL RUBBER BUILDS

MILWAUKEE, April 19—A factory extension project involving an investment of approximately \$500,000 in buildings and equipment has been undertaken by the Federal Rubber Co., at its main works in Cudahy, suburb of Milwaukee. Three new six-story buildings, 163 x 220 ft., of brick and steel construction, have been started and will be ready for production within 90 days.

Indianapolis Stops Plant Encroachments

Ordinance Prohibits Erection of
Factories Within 500 Ft. of
City's Boulevards

INDIANAPOLIS, April 17—Aiming at the Craig Hunt Motors Co., which proposed to erect a manufacturing plant at Meridian Street and Maple Road Boulevard, the Board of Park Commissioners, controlling the administration of the boulevards, has passed an order prohibiting "horse racing, gambling, offensive or dangerous business" within 500 feet of any of the city's boulevards in an effort to prevent the commercialization of residence districts under the jurisdiction of the board.

Automobile concerns, notably the retail district on Meridian Street, have made severe industrial encroachments on the boulevards and when the Craig-Hunt company announced its plan to erect a factory and service station at the juncture of the two boulevards in the heart of the city's most fashionable residence district, there was a general civic protest.

The Craig-Hunt company has issued a public statement pointing out the locations of other companies on the boulevards, all without protest, and asks why discriminate against it.

The city has become alive to these encroachments, and for the preservation of the future city beautiful, the park board has decided that industrial concerns cannot invade the residence districts.

DEERE ADDS PLANT SPACE

WATERLOO, IOWA, April 16—Improvements which will cost more than \$500,000 and which will add 90,000 sq. ft. of floor space will be made by Deere & Co. at its plant here during the coming summer. Additions begun last fall have just been finished. When present plans are completed the company will have one of the most modern plants in the tractor industry.

The additions which will be erected during the summer are foundry building, cupola building, casting cleaning mill, service building, core room and foundry material storage yard with necessary railway tracks. The buildings will be of modern design.

AUSTRALIA TO REVISE TAX

NEW YORK, April 17—Protection for new Australian industries is provided for in the new tariff bill which has been introduced in Parliament, it is announced by the trade commissioner here. Tariff increases ranging from 5 to 20 per cent on more than 500 items would be authorized with provision for deferred duties on several products, including iron and steel. British importations would be given preferential treatment and countries agreeing to reciprocity would have favored treatment.

Automobiles Popularize Dutch Tramcars



Wheels fitting the car tracks were adjusted and the automobile was used to haul the cars, sometimes singly, sometimes in trains, in the city of Apeldoorn, Holland. Since supplanting horses with the speedier traction power the cars have gained new popularity

Detroit Factories Back on Part Time

Forty Per Cent of Power Restored By Edison Company to Industry

DETROIT, April 20—Volunteer switching crews proved so successful, Detroit Edison Co. announced last night that 40 per cent power would be restored to factories to-day, resulting in resumption in practically every factory save Packard. The Packard company has been operating on its own power up to Saturday, when its fuel supplies were exhausted.

Though the order will return to work about 50 per cent of the 100,000 idle men, four and five hour shifts will be the rule for some time and production will be greatly curtailed. Dodge Bros., who had retained about 9000 of its 18,000 employees, resumed in all but fifteen departments, reducing the number idle to 4500.

Hudson-Essex resumed in all departments on a five hour schedule. Cadillac started plants No. 3 and No. 8, all employees working from 7 a. m. to noon. The night shift will work from 1 p. m. to 6 p. m. Sixteen departments in the main plant will work half day and fourteen departments full day. The time has been divided to benefit the greatest number of employees.

Fisher Body Corp. started all departments with a full force of employees, but will work only part time temporarily. At the Fordson Dearborn tractor plant work was resumed in nine departments on full time. Ford Motor Co., which had worked in part throughout the tie-up, using emergency power, will resume in all departments, using both Edison and the emergency power.

Studebaker Corp. resumed in eight departments. Hupp also resumed in some departments. Maxwell-Chalmers started about 50 per cent of its idle employees and will work half time temporarily. Paige, King, Columbia, Liberty, Nelson and Scripps-Booth will resume in all departments on part time. In the parts plants work is being resumed on about the same basis as in the car factories.

Coming just after record production in March the railroad tie-up has worked special hardship on the factories. Deliveries promised in April will be greatly reduced. This will work out especially hard on the dealers in the distant points, who were without cars all winter, and who were just beginning to get a few over the drive-away route.

The shut down of a full week is expected to work a further hardship in the Detroit factories owing to employees being spirited away to plants in communities less affected by the tie-up.

OAKLAND TO DOUBLE OUTPUT

PONTIAC, MICH., April 16—Production doubling that of the last four years is planned by the Oakland Motor Car Co. during the year beginning July 1,

when the extensive building additions will have been completed and all departments of the plant are in operation in the immense new factory. Additions to the engine plant, the assembly department and a large four-story warehouse now are in course of construction and rapidly nearing the completed stage. It is planned to have a daily output of 320 cars when all departments of the factory are started in the new plants.

H. C. S. Selects Site for New Factories

INDIANAPOLIS, April 18—The H. C. S. Motors Co. will build its new plant at Fourteenth Street and Capitol Avenue. It will consist of two buildings, each a four story structure, with a 60-foot frontage and 200 feet in depth. One unit is being rushed to completion. When it is ready to occupy, work will be started on the other unit. The estimated cost is \$500,000.

The H. C. S. Motors Company is now occupying a part of the Stutz Fire Engine Co. The business of the fire engine company demands all the room at its disposal. Since the perfect score made by the Stutz fire engines at the test in Kansas City many municipalities have placed orders for the Stutz engines.

The new Stutz plant will be modern in every way, with every convenience for employees. "At present we are bringing through our first car but we must have more room for a production of five to ten cars daily. We hope to be in the first unit by July 1," said President H. C. Stutz in a recent statement.

STRIKE DELAYS SUNBEAMS

NEW YORK, April 17—The molders' strike in Great Britain has seriously interfered with deliveries here of Sunbeam cars and Dario Resta, the American distributor, probably will not have more than 50 instead of the expected 100 cars to market in 1920. Twenty of these have been received. Despite the curtailed supply, Resta has appointed distributors in three cities, Durant in San Francisco, Caldwell in Boston, and Branstetter in Chicago.

REMY EMPLOYEES GET BONUS

INDIANAPOLIS, April 18—The Remy Electric Co. of Anderson, on April 10, presented to 140 of its older employees shares of General Motors stock ranging in value from \$400 to \$700, to be delivered in a year. The stock will be presented annually as a bonus to older employees.

ADVERTISERS OPPOSE BILL

WASHINGTON, April 16—A protest against the Thompson bill which would impose a tax on advertisers has been sent to the House ways and means committee by representatives of the 21 departments of advertising who attended a meeting at Cleveland early this month of the National Advertising Commission.

G. M. C. Cuts Prices to British Buyers

Retroactive Reduction on Sales Since February 10 Sets Pre- cedent Abroad

LONDON, March 25 (*Special Correspondence*)—According to the American Chamber of Commerce in London, the General Motors Co., Ltd., which is well known as one of the largest motor making organizations in the United States, has decided on an immediate reduction in the prices of its standard models. The chassis and cars affected by this decision are the Buick and Oldsmobile. The company has taken a step which is without precedent in the motor industry, in that they made the reduction retroactive from Feb. 10. Consequently all purchasers of such cars from that date will receive a very welcome refundment of £70, or about \$350.

The British motor industry has received the announcement with mixed feeling, as the competition they are now facing will be greatly intensified, for, as the American Chamber points out, manufacturers in America have laid down 1,000,000 cars as their export program for this year, and even now there are 174 different makes of cars, excluding three-wheelers and cycle-cars offered for sale to British motorists, of which 75 only are of British manufacture, the rest being of American, Belgian, French, Dutch and Italian origin.

The announcement will, however, says the American Chamber, be very welcome to the general public as indicating that there is at least one industry in which prices can be reduced, which may to some extent have its effect on the cost of living, since motor transport is one of the factors determining that cost.

NEW YORK OFFICE NOT NOTIFIED

NEW YORK, April 13—No notice of the change in prices has been received at the offices here of the General Motors Export Corp. It was said the British company had full authority to make the reductions if conditions warranted. Whether similar reductions would be made on other cars of the General Motors group could not be learned.

FRANKLIN HAULS BY TRUCK

SYRACUSE, N. Y., April 19—The Franklin Automobile Co. kept its plant running at capacity during the railroad strike by bringing in raw materials on its own fleets of trucks from Buffalo, New York, Troy, Oriskany and other points.

MAXWELL PRICES ADVANCE

NEW YORK, April 20—Prices will be advanced \$100 on all models of Maxwell cars and trucks on May 1. Word to this effect was received here to-day by the Maxwell-Chalmers branch.

War Department Tries Metal Planes

First of Four Ready for Tests at
McCook Field—Details
Withheld

NEW YORK, April 20—The War Department is experimenting seriously with the use of metal in military airplanes, it became known to-day. Details of construction have not been disclosed but one of the planes has been delivered at McCook field for test flights.

The machines, four in number, are being built at the plant of the Empire Aircraft Corporation at College Point, which is allied with the Empire Art Metal Co. The company is unable to describe the machines because a clause in its contract prescribes secrecy. It has been learned, however, that the planes closely resemble the JN type.

The fuselage is entirely of metal and there is a metal box wing beam as well as metal web. The wings are of ordinary airplane fabric. No information is available as to the metal used. It is understood, however, that duralumin

which has been employed in German metal planes is not available in this country.

The Germans were pioneers in the use of metal in airplanes. Machines of this type were in use on a front a few weeks before the armistice and one of the Junker type was brought to this country but crashed at Mineola on a test flight. The British experimented with metal in a Bristol plane.

It is held that the chief advantage of the use of metal in a military plane is an added element of safety for the pilot. This is the main consideration for if a metal plane crashes it is almost certain to be damaged beyond repair.

LAWSON AIRCRAFT BUILDS

SOUTH MILWAUKEE, WIS., April 19—The Lawson Air Transportation Co., 425 East Water Street, Milwaukee, has awarded contracts for a brick and steel assembling shop, 72 x 162 ft., at its aircraft works in South Milwaukee. It is building twenty giant air liners for transcontinental passenger and express traffic, designed by Alfred W. Lawson, who last fall made a successful round trip in the first model to New York, Washington, and Baltimore and return to Milwaukee.

London-Paris Air Service May Stop

Failure of Government to Support
Civil Aviation Develops Crisis
in England

LONDON, March 25 (*Special Correspondence*)—According to the American Chamber of Commerce in London, the intentions of the British Government in regard to civil aviation as disclosed in the recent debate in the House of Commons have caused a sensation in aircraft circles. In two clearly defined sentences, the Secretary of State for Air told the whole story. "Civil aviation," he said, "must fly by itself. The Government cannot possibly hold it up in the air."

This announcement has been followed by the resignation of Holt Thomas, chairman of the Aircraft Manufacturing Co., Ltd., the originator of the famous London-Paris Air Service, the whole future of which is now at stake.

Thomas says that it is more profitable to produce other things than airplanes, and that the production of aircraft will in the future tend to be a mere side line unless assistance is given to finance the designing and building of experimental machines. The mail service between London and Paris is now in danger of collapsing as a result of the policy of the Government.

British public opinion has been aroused to such an extent, by the threatened collapse of civil aviation, the lack of funds with which to build experimental machines, and what this is likely to mean to the nation, that the Government has become alarmed, and have resuscitated the committee which formerly met to discuss what assistance, if any, should be given to civil aviation.

TO COMBINE FLYING CLUBS

NEW YORK, April 16—The first step toward the amalgamation of the Aero Club of America and the American Flying Club has been taken by the decision of the Board of Governors of the former organization to appoint a committee to seek a basis of understanding between the two. The American Flying Club was formed as the result of a break in the ranks of the Aero Club because army and navy pilots did not feel the organization properly represented the flying side of aviation. The newer club sponsored the New York-Toronto and coast-to-coast air races.

MACHINE COMPANY EXPANDS

DAYTON, April 16—The Recording & Computing Machines Co., has increased its capital to \$4,000,000 to prepare for handling business on a large scale. Will I. Ohmer, president, announces that among the products now being manufactured are magnetos, generators, starters, battery ignition systems and small utility electric motors.

Traction Engine Exports, by Countries, During February

Countries	Gasoline		Kerosene	
	Number	Dollars	Number	Dollars
Bulgaria	3	4,136	.....	.....
Denmark	3	4,200	.....	.....
France	157	161,766	345	168,154
Hungary .....	.....	.....	6	11,020
Italy	8	11,000	.....	.....
Netherlands	5	3,000	.....	.....
Norway	15	19,660	56	14,247
Poland and Danzig	14	18,863	.....	.....
Portugal	3	10,839	.....	.....
Roumania .....	.....	.....	6	5,988
Spain	13	15,014	46	7,299
Sweden	23	18,350	.....	.....
England	12	20,943	803	207,420
Canada	512	445,419	575	484,185
Panama	1	976	.....	.....
Salvador	8	1,917	.....	.....
Mexico	35	74,491	6	5,265
Newfoundland and Labrador .....	.....	.....	7	5,653
Jamaica	3	2,100	1	100
Cuba	7	4,200	4	8,910
Haiti	4	25,695	.....	.....
Dominican Republic	3	13,665	.....	.....
Argentina	114	88,614	.....	.....
Brazil	10	2,199	2	135
Chile	63	31,999	.....	.....
British Guiana	6	8,302	.....	.....
Peru	48	20,750	.....	.....
Venezuela .....	.....	.....	7	4,900
British India	12	11,878	22	7,669
Dutch East Indies	12	24,868	.....	.....
Japan	2	7,675	.....	.....
Australia	2	3,170	70	5,510
New Zealand	26	26,336	.....	.....
Philippine Islands	4	7,650	29	4,902
British South Africa	25	25,549	5	6,306
French Africa	216	133,497	49	23,232
Portuguese Africa	1	1,914	.....	.....
Egypt	1	912	.....	.....
Totals	1,371	1,251,547	2,079	976,895

Holland Develops Aviation Division Government Takes Over Interned Planes—Fokker to Build at Amsterdam

NEW YORK, April 16—The Dutch government is lending substantial support to aviation, but American manufacturers have not obtained a foothold there and there is little prospect they will be able to do so, according to a letter from the United States commercial attache at The Hague sent to the Manufacturers Aircraft Association by the State Department.

Holland has bought all the French planes which were interned in that country during the war and a large number of German machines interned there. When the American naval attache offered to sell the government a D-11 hydroplane he was informed Holland was not in the market at this time. It is believed the Dutch expect to obtain German machines of this general type at a lower price.

A committee of the directors of "Vickers House" at The Hague and several officers of the Dutch Indian army are making technical studies in the Vickers factories in England. The committee is preparing itself for the establishment of factories in Holland and the Dutch Indies as well as for the delivery of machines.

Airplanes and hydro-airplanes needed for military operations in the Indies have been ordered from Vickers factories. The Dutch government will subsidize a factory to be erected at Amsterdam by Fokker, although there is something of a revulsion of feeling against him because he renounced his Dutch citizenship during the war to build planes for use in military operations against the Allies.

The Dutch propose to establish an aerial mail service between Rotterdam, Flushing and the Zeeland islands. Another route under consideration is one from Holland to its East Indian colonies.

FORD VALVE PLANT STARTS

NORTHVILLE, MICH., April 16—Operations have been started in the new Ford factory where valves for Ford engines are being turned out. More than 100 men are employed in the plant. As soon as the weather permits work on the power dam which will form a 20-acre lake in this village will be started.

TURNER EXTENDS FACTORY

PORT WASHINGTON, WIS., April 19—Extensions aggregating 50,000 sq. ft. will be made to the foundry and machine shops of the Turner Mfg. Co. at Port Washington, Wis., to provide much-needed capacity for manufacturing Simplicity farm tractors, gas engines, etc. The site is provided largely by reclaiming three-quarters of an acre of land from Lake Michigan by the con-

struction of a concrete seawall east of the present shops.

F. M. Smith, president and treasurer of the Turner company, has resigned and Francis Bloodgood, Jr., of Milwaukee, has been elected president.

W. J. Niederkorn, secretary and sales manager, has organized a company to take over the exclusive distribution of Turner tractors, engines and other products in the state of Wisconsin. Headquarters have been established in Port Washington. The present salesforce in Wisconsin is taken over and will be materially increased in size.

Goodyear Hall to Develop Tire Workers

AKRON, April 17—Goodyear Hall, the \$2,500,000 recreational institution and industrial university of the Goodyear Tire & Rubber Co., was formally dedicated to-day. It is one of the most pretentious buildings ever erected for the welfare of employees.

The principal feature of the new building is the Industrial University with a faculty of 117. It already has an enrollment of 4700.

The university has 65 class rooms, four large laboratories and large assembly and lecture rooms. All forms of study are embraced in the curriculum from rudimentary grade school classes and Americanization classes for the foreign-born, to standardized collegiate post graduate courses for those desiring to round out incompleting college careers. A. C. Horrocks of Cleveland is dean. The 600 classes, arranged to accommodate all three daily eight hour shifts, are open to bona fide employees without tuition charges.

The hall also includes a large auditorium, a gymnasium, a cafeteria to feed 8000 daily, 12 bowling alleys, six rifle ranges, dormitory rooms and locker rooms.

AUSTRALIAN BUYS TRUCKS

NEW YORK, April 17—After a trip around the world to place an order for American built trucks, J. B. Clarkson, of Sydney, Australia, sailed for home this week. He was accompanied by Mrs. Clarkson. He has been around the globe fifteen times since he went into the bicycle business in Australia in 1903. He is now one of the largest importers of automotive equipment in his country and frankly admits the superiority of design of American automobiles and trucks. He spent much of his time in this country at the plant of the Dearborn Truck Co. in Chicago.

MICHELIN TIRES INCREASE

NEW YORK, April 17—Following are the prices of the Michelin Tire Co. for the more popular sizes: Non-skid, fabric casing, 30 x 3, \$18.65; 30 x 3½, \$23.00; 32 x 4, \$36.90; non-skid, cord casing, 32 x 4, \$55.50; 34 x 4½, \$66.00; 35 x 5, \$82.00.

Pic-Pic Post-War Models Arrive Here Four-Cylinder Car at \$6,200 Will Be Followed by 8-Cylinder Model Later

NEW YORK, April 15—The first sample of a Pic-Pic post-war model has been received in this country and is being exhibited by Spyros Papaspyros, the American general agent. The Pic-Pic was originally developed by Picard & Pictet of Geneva, Switzerland, and is fitted with a single sleeve motor, the sleeve having a compound movement. About a year ago all patent rights outside of Switzerland were purchased by the Gnome & Le Rhone Engine Co., who own large works in a suburb of Paris. Preparations have been made for a monthly production of 200 cars, and Papaspyros hopes to dispose of 15 a month in this country.

The model which has been received is a 4-cylinder machine with 3 5/16 by 5½ in. cylinders. It has a tax rating of 16 hp., but is claimed to develop 55 hp. The chassis alone sells at \$6,200, and the complete car, with closed body, Westinghouse lighting and starting system, vacuum fuel feed, Houdaille shock absorber, etc., for \$8,700. An 8-cylinder model with the same cylinder dimensions will also be built.

OBERBERGER ADDS TO CAPITAL

MILWAUKEE, April 19—The John Oberberger Forge Co., Milwaukee, has increased its capital stock from \$500,000 to \$750,000 to finance important extensions of the works in West Allis, a suburb. The company was established in August, 1916, by John Oberberger, a pioneer drop forge operator of Milwaukee. The original building was 100 x 100 ft. This is being enlarged to 100 x 330 ft., with an auxiliary building, 125 x 175 ft., a power house, 80 x 100 ft., and a warehouse and shipping building, 70 x 125 ft. The company specializes in automotive forgings, including crankshafts and camshafts for engines. It has on its books orders for more than \$2,000,000 and expects a production valued at \$3,000,000 in 1920, through additions now being erected and equipped.

COLUMBUS TIRE EXPANDS

COLUMBUS, April 19—Papers have been filed with the secretary of state increasing the authorized capital of the Columbus Tire & Rubber Co., from \$800,000 to \$1,275,000. The additional capital will be used to erect a large addition to the plant which is located on West Goodale St., Columbus. The present plant has a capacity of 1000 tubes and 2,000 tires daily which will be increased. John B. Brennan has been made executive head of the concern. He was formerly connected with the Ohio department of agriculture.

Production Slow in German Factories

Demand in Domestic Market Swamps Industry—Cars Lack Pneumatic Tires

WASHINGTON, April 19—Production that comes far from satisfying the home demand marks the present output of the automotive plants of Germany and Austria. This is revealed in the translation of a Spanish trade document just made public by the Bureau of Foreign and Domestic Commerce. Strikes and labor controversies, shortage of raw materials, high wages and the lack of skilled workers, particularly for such labor as the installation of the engines, are given as the causes for the low output. Most machines are promised for delivery in 1921.

The better known German cars, the report states, are commanding sales prices from 100,000 to 200,000 marks, with delivery uncertain. Smaller machines, such as the two-passenger, 8 hp., Wanderer, however, are quoted at some 40,000 marks, and are much in demand. Numerous factories have no cars at all for sale. In Austria, the Avstro-Daimler is soon to be in production, with three models, one of which is a new six-cylinder.

"The production, in its reduced volume, can not satisfy even the domestic needs," the report states. "In Germany and Austria, during the war, no private person was allowed to have an automobile, with the sole exception of the few physicians who had not been mobilized. When the war ended, and with it the restriction, all those who had formerly owned automobiles wanted to have them again, and the demand consequently was much in excess of the supply. The State sold a large number of cars from the remaining war stocks, at prices rather high; nevertheless, there is a lively demand for new cars just coming from the factory.

Demand Causes Price Increase

"It is evident that this demand has tended to increase prices, even more than the exportation of automobiles, which, owing to the falling exchange value of the mark, requires an increase in prices if it is to be profitable. It is said that sales to foreigners will only be made in stable money. Austria is already pursuing this policy and demanding payments in Swiss francs. Another solution proposed is that adopted by the Publishers' Association, that of reckoning exchange at a fixed rate. Both of these methods tend to increase the prices.

"In addition, there is the tax and the export permit. Germany is now considering the introduction of a new tax of 25 per cent ad valorem. An export permit costs about 4,000 marks, and application for it must be made at Berlin. It takes from two to three weeks before a permit is issued.

"Nearly all the chassis are provided

with electric starters, lights, and horns. The electric equipment, manufactured by Bosch, which is used on most of the good cars, costs 14,000 marks. Delivery is made f.o.b. factory, unless the contract provides to the contrary, but the cars lack pneumatic tires, as both countries are almost wholly bare of this article.

"The prices vary enormously with the terms of delivery, whether it is to be made immediately or at some future time. On the average, the manufacturers promise delivery in the spring of 1921. As a result, such cars as are finished and are ready for delivery command very high prices which for some types of cars are double the factory price.

Franklin Establishes Co-operative Store

SYRACUSE, N. Y., April 17—Employees of the H. H. Franklin Mfg. Co., acting co-operatively and for the present through a committee headed by George S. Dutcher, employment manager, will open a general store and market on May 1 to combat the high cost of living. The enterprise will be operated on a site adjacent to the Franklin plant, including a grocery store and meat market with stalls in the rear for a produce market. Prices will be fixed by a committee of Franklin workers. Two-thirds of the employees of the plant live within a radius of a mile from the site of the store.

The management will be exclusively under the direction of the Franklin employees who will finance it and supplies will be sold exclusively to Franklin workers. The store will keep in stock stable groceries, tea, coffee, smoked meats, tobacco, cigarettes, and articles of clothing such as overalls, working shirts and caps. It is expected to result in a saving of 20 per cent to the workers.

TRUCK TREATISES WIN PRIZES

CLEVELAND, April 16—The first prize of \$1,000, offered by the Lakewood Engineering Co., for the best treatise on industrial haulage, using Lakewood Tier-Lift trucks, was awarded by the committee appointed by the Society of Industrial Engineers to Clarence Irving McNair, Jr., of Cloquet, Minn. McNair, who is secretary of the Northwest Paper Co. of Cloquet, won the prize with a paper entitled "Analysis of the Application of the Tier-Lift Truck to the Pulp and Paper Industry."

Second prize was awarded to F. C. Peters, chief mechanical engineer, and G. R. Reese, assistant mechanical engineer, New Jersey Zinc Co., Palmerton, Pa. Theodore M. Prudden of the Whittin Machine Works, Whitinsville, Mass., was awarded third prize for an analysis entitled "The Tier-Lift Truck—Its Field of Usefulness." F. L. Usner, with L. V. Estes, Inc., of Chicago, and Frederick L. Fish, industrial engineer with the Fisk Rubber Co., Chicopee Falls, Mass., were given honorable mention.

Propose Road Work Under New System

Experts Would Reconstruct All Highways on Scientific Basis—Politics to Be Ousted

NEW YORK, April 16—Highway organizations here and throughout the country are receiving many complaints of roads badly damaged by heavy truck traffic. The condition has been aggravated by the greatly increased truck business resulting from railway congestion and the necessity of getting goods distributed by the only reliable means at hand.

Even the most enthusiastic of good roads partisans did not foresee the tremendous development of motor truck transportation which has come in the last two or three years, but which still is in its infancy. The result is that roads built in the old style have been unable to carry the burden placed upon them.

There is apparent, however, no disposition to curb the use of trucks. The chief result thus far of road damage has been legislation enacted in several States to limit the weight of trucks and the loads they may carry. These limits, in some cases, are less than those set by the National Automobile Chamber of Commerce in its proposed uniform vehicle law, which fixes the maximum weight of vehicles at 28,000 lb. and of loads at 800 lb. per inch width of tire upon any wheel concentrated upon the surface of the highway.

The only solution seen by highway experts for a problem which is becoming manifest in all parts of the country is a reconstruction of the entire highway system, which will entail tremendous expense and which will have to be done gradually.

It is contended that only such types of materials as granite block, concrete and wood block should be used on the main arteries of travel, and it also is asserted with the utmost emphasis that with good roads building costing as much as it does now, routes should be laid out with regard only for economic considerations and the serving of the largest number of persons.

It is held that if the country is to be provided with a highway system adequate to its needs, highway building must be divorced absolutely from politics and political patronage. Enormous sums in the aggregate have been spent in the past in building good roads which serve only a few people and which are not likely to increase greatly in usefulness in the near future.

TIRE OUTPUT 85,000 A DAY

AKRON, April 16—Akron factories are turning out tires at the rate of 85,000 a day, according to figures compiled by the B. F. Goodrich Co. This is 25 per cent more than one year ago. When additions to Akron factories, now under way, are completed, production of 10,000 tires a day will be possible.

INDUSTRIAL NOTES

Du Pont Automobile Co. has awarded a contract for the erection of the initial building of its proposed new works at Prospect Park, near Philadelphia. The entire plant is expected to cost in excess of \$1,000,000. Paul Du Pont heads the company.

Novo Co., Lansing, Mich., has received equipment for additions to its foundry plant and construction work is well under way. Completion is expected by June 1, increasing the output by 85 tons daily.

Taylor Motor Car Co.—Creditors are filing claims and efforts are being made to get litigation adjusted before plant at Fremont, Ohio, is taken over by company which recently purchased the property.

India Tire & Rubber Co., with plants at Akron and Mogadore, Ohio, expects to double its production of tires this year by the erection of an additional factory.

Latex Tire & Rubber Co., organized last May, already has erected the first unit of its plant at Fond du Lac, Wis., with a capacity of 300 tires and 700 tubes a day.

Menges Motor Truck Co., Greenville, Miss., has purchased Churchill compress grounds and warehouse for \$100,000 and will soon begin manufacturing a motor truck.

Dixie Rubber Co., of which L. C. Cadenhead has been made manager, reports that it expects to invest \$500,000 in its tire manufacturing plant at Memphis, Tenn.

Superior Tractor Co., Cleveland, has purchased for upwards of \$200,000 twenty acres of land for erection of farm tractor plant to cost \$125,000.

Floyd J. Logan Aviation Co., Cleveland, will erect an airplane garage with capacity for a dozen planes on a field seven miles from the city.

Allen Tire & Rubber Co., Allentown, Pa., has broken ground for large factory on Allentown-Bethlehem Pike.

Paragon Motor Car Co. hopes to have the first of its new 4-cylinder cars ready by August 1, next.

Wawasee Tire & Rubber Co. is planning the erection of a \$600,000 plant at Syracuse, Ind.

Ajax Rubber Co. expects to break ground for its new factory at Sandusky about May 1.

TO ASSEMBLE CANADIAN CAR

MONTREAL, April 16—Organized for the purpose of assembling automobiles in Canada, the Forster Motor Car & Mfg. Co., Ltd., Montreal, has a capital of \$1,000,000, divided three-fifths preferred and the remainder common. The company has purchased a plant having an annual capacity of 800 cars in Maison-

neuve, a suburb of Montreal. It also has purchased the adjacent land on which it contemplates building a modern motor car factory late in 1920. A contract has been closed with Southgate, Ltd., London, for 10,000 chassis, worth \$16,500,000, to be delivered within ten years. This company has the agency for this car in Great Britain, Ireland and India and will build its own bodies.

British Defer Change
in Automobile License

LONDON, April 20 (*Special Cable*)—The British government has decided to defer until Dec. 31 abolition of the petroleum taxes and increased imposts on motor cars.

The change in the tax system was proposed by the Society of Motor Manufacturers and Traders. It would provide a more equitable burden for the English car owner, but he still would be taxed more heavily than the American.

Owners of motor vehicles in England now pay taxes in the form of an impost on fuel instead of paying registration fees. The Society of Motor Manufacturers and Traders recommended that a registration system be adopted to provide the \$35,000,000 revenue which now comes from fuel taxes. It is this proposal which the government has decided to defer putting into effect.

Nebraska Dedicates
Engineering Building

LINCOLN, NEB., April 17—The new \$250,000 agricultural engineering building of the University of Nebraska was dedicated here yesterday. The American Society of Agricultural Engineers was represented at the exercises by a delegation of 25 members.

The chug-chug of farm tractors under test was plainly to be heard while the exercises were under way. At an informal meeting in the evening President Kranich of the engineers' society was the principal speaker and emphasized the importance of standardization in tractors. He held that tractors were purely farm machinery and that the problems connected with them should be solved by agricultural engineers exclusively.

Secretary Davidson of the society urged close co-operation with the National Implement and Vehicle Association.

APPERSON HOLDS ELECTIONS

KOKOMO, IND., April 21—Stockholders of the Apperson Bros. Automobile Co. have elected the following directors: Mrs. Elmer Apperson, Edgar Apperson, A. G. Dawson and T. E. Jarrard. The directors later elected Edgar Apperson president, Jarrard vice-president and Dawson secretary-treasurer. Because of the long illness of Elmer Apperson, which ended with his death at Los Angeles, no changes in the management of the company will be necessary.

METAL MARKETS

Pig Iron.—Pending return of normal transportation facilities, producers and sales agents are disposed to let previous quotations for foundry irons continue as nominal price levels. While no new business has been placed, purchasing agents in the automotive industries are reported to have put out inquiries for third quarter deliveries.

Iron and Steel.—Steel output has been impaired as the result of the railroad tie-up, but not to the extent that might have been expected. The Bethlehem Steel is operating to the extent of 75 per cent capacity, which is about normal and, while a few plants are turning out only a quarter of their regular production, the dent put into output as a whole will barely exceed half a week's production which, if the worst is over, can be easily made up. Some of the independent producers of automobile sheets are reported having considerable of their third quarter capacity unsold, and, in some instances, it is said that even part of their second quarter production is still available.

Aluminum.—The market continues very firm at 33 cents for virgin ingots, 98 to 99 per cent pure. Several lots of French aluminum have arrived at New York of late, but in spite of reports that in the so-called "outside" market lower prices prevail, consumers find it impossible to shade 33 cents for reputable brands. The French metal coming in is reported to have been sold in advance and there is no disposition on the part of the foreign producers to cut the prices of the American company. There are a number of odd lots of imported aluminum on the market, consisting either of American metal which, because of the exchange situation, it paid to re-import from Europe, or of nondescript ingots for the purity of which there is no guarantee. It is possible that these lots may be obtained at as low as 31 and 32 cents. But the market for strictly virgin aluminum is as firm as ever. Rolled aluminum is in excellent demand.

Copper.—The market is dormant with producers quoting 19½ and 19¾ cents, but ample supplies obtainable in the resale market at 18½ cents for electrolytic, 18¾ cents for casting and 19 cents for Lake.

Lead.—The market is quiet at 9 and 9¼ cents, New York basis.

Zinc.—Very little demand is noted, with prices on the toboggan. Prime Western is quoted at around 8.35 cents, East St. Louis.

Brass.—The principal manufacturing interest in the Connecticut brass valley has every roll turning, and if labor were plentiful would have a night shift. All brass produced is for domestic use, much of it for the automotive industries which maintains a steady demand. Prices show little change, remaining at about the same level as last week and for some time past.

Automotive Financial Notes

General Aluminum & Brass Manufacturing Co. is offering \$1,000,000 in 8 per cent cumulative preferred on the market; has filed its balance sheet showing current assets of \$2,030,153.26 and current liabilities of \$395,773.47. Total assets are \$3,285,280.45. Net sales during 1919 were \$4,482,205.34, and profits after interest and federal taxes were \$304,354.07. The issue just placed on the market is to be devoted to the increase in working capital and to provide for necessary expansion facilities.

Linderman Steel & Machine Co., Muskegon, reported surplus profits of \$565,289.31 at the end of the fiscal year Dec. 31. Total assets are \$4,831,648.73, of which \$933,881 is cash and securities; \$1,701,541.56 accounts and notes receivable; \$548,951 materials and \$305,592 plant and equipment. The company reserved \$1,300,000 out of earnings for 1920 taxes. Preferred stock outstanding is \$590,000 and common \$1,068,000.

Republic Rubber Co.—Balance sheet of Feb. 29 showed current assets of \$10,735,567 and current liabilities of \$5,684,140. President Jones reports economies in administration and overhead will permit saving of \$1,000,000 annually and that business soon will be "on an earning basis."

Fisk Rubber Co.—Annual report shows surplus after Federal taxes of \$3,994,657, equivalent after deduction of preferred dividends to \$5.99 a share (\$25 par value) as compared with a surplus of \$2,506,853, or \$19.50 (\$100 par value) earned on \$8,000,000 common stock in 1918. Net sales in 1919 were \$43,613,975.

McIntyre Motor Sales Co., incorporated at Kalamazoo with capital of \$250,000 to manufacture and sell internal combustion engines, automobiles, tractors and trucks. Frank W. Holmes and W. H. McIntyre, Kalamazoo, are the largest stockholders.

Hood Rubber Co.—Understood company will pay cash dividends of at least 6 per cent on common as increased by 66 2/3 per cent stock dividend. This would be equivalent to 13 1/2 per cent on old issue of \$3,000,000.

Bukolt Mfg. Co., Stevens Point, Wis., is increasing its production of highway tire protectors from 40 sets daily to 100 sets. The device has been improved by the use of an outer blanket of rubber over the metal tread.

Truscon Steel Co. stockholders have approved distribution of a 20 per cent dividend in stock to holders of record March 31. The directors also have paid the April quarterly dividend of 4 per cent in cash.

White Motor Co. stock is showing unusual strength as the result of the impression that the \$4 annual dividend rate is to be increased and the report that the company may also declare the stock dividend.

Timken Roller Bearing Co. expects to be employing 3000 men in its Columbus

branch within a year. More than 1000 men already are at work and are turning out 1500 assembled bearing cases daily.

Ryan-Bohn Foundry Co., Lansing, Mich.—Incorporated with \$2,000,000 to do a general foundry and machine business, specializing in automobile parts.

Mason Tire & Rubber Co.—Reports sales for March of \$1,067,000, largest single month in its history. Has absorbed Mason Cotton Fabrics Co., which is now known as textile division.

Pan Motor Co.—Authorized by Minnesota State Securities Commission to sell \$2,000,000 of its preferred stock in that State, the proceeds to be used as manufacturing and working capital.

Northway Motors Corp.—Northway Guaranty & Deposit Corp., organized in Massachusetts particularly to discount notes of Northway Motors Corp., capitalized at \$12,000,000.

J. I. Case Threshing Machine Co. has purchased the foundry of the Universal Machinery Co., Milwaukee, to provide much needed gray iron castings for its automotive works.

Stewart-Warner Speedometer Corp.—President C. B. Smith reports sales for first quarter amounting to \$3,942,000, compared with \$2,074,000 for the same period in 1919.

The Mura Motors Corp., New York.—Incorporated with an active capital stock of \$220,000 by G. W. Rollo, E. F. Hills, and D. Robinson to manufacture automobile engines.

General Motors Corp.—Plans to give stockholders the right to subscribe to 3,000,000 shares of new stock at \$30 a share to the extent of 20 per cent of their holdings.

Morris Bros., Racine, Wis., brass founders, have acquired a building at Fond du Lac which is being equipped for both brass and aluminum casting.

Liberty Wheel Co., Greenville, O.—Incorporated with capital of \$75,000 to manufacture automobile and truck wheels.

Snap-On Wrench Co., Milwaukee, is a new company formed to manufacture and sell patented wrenches and other tools.

Columbus Tire & Rubber Co.—Capital increased from \$800,000 to \$1,275,000 to erect large addition to plant at Columbus.

All-Tite Chain Co.—Being organized in Milwaukee by F. E. A. Hoya to build a factory at Cedarburg, Wis.

Russell Motor Car Co.—Declared quarterly dividend of 1 1/4 per cent on both preferred and common stock.

Lee Rubber Co.—Reported that directors will decide upon resumption of dividends at meeting April 29.

Nycla Rubber Co., Elyria, Ohio.—Incorporated with \$200,000 capital by C. C. Bowers and L. F. Bowells.

Acme Motor Parts Corp., Milwaukee, has added \$50,000 to its capital in order to enlarge production.

Akron Universal Tire & Rubber Co., Medina, Ohio.—Incorporated with capital of \$515,000.

Kelsey Wheel Co.—Declared quarterly dividend of 1 1/4 per cent on preferred stock.

Bank Credits

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

The raising of the Bank of England's minimum rate of discount to 7 per cent, and of that of the Bank of Japan to 10 per cent calls attention sharply to the world-wide shortage of credit. The current yields on Government securities, as well as on those of corporations, meanwhile, reflect the shortage of a long-term capital. The late spring normally sees easier money and credit liquidation, and it will, therefore, be of interest to watch developments this year as furnishing an index of what may be expected when the usual heavy fall demands for money begin.

In this connection it is worth noting that at a time of the year when Western banks are usually in a position to send money to New York, the Federal Reserve banks of Chicago, St. Louis, Minneapolis and Kansas City are borrowing more than \$58,000,000, while New York and Boston are lending more than \$72,000,000.

There are no present indications of further movements of gold either into or out of the country.

DAIMLER EXTENDS INTERESTS

NEW YORK, April 20—Through action taken at a general stockholders' meeting held in Stuttgart on March 15, the Daimler Motor Co. has taken over control of the Esslingen Machinery Mfg. Co. The Frankfurter Zeitung reports that the deal was effected by issuing preferred 4 per cent stock to the amount of 4,000,000 marks by each company and then exchanging it. In future stockholders' meetings the Daimler preferred stock will possess a voting power 16 times as great as indicated by its face value. During the war the Daimler company was one of the greatest profiteers in Germany, and was the object of several interpellations in the Reichstag, but since the armistice its affairs have gone very badly. William Hohenzollern is said to be a big stockholder in this concern.

TO EXTEND THEFT BUREAU

NEW YORK, April 20—With the increasing number of automobile thefts, the automobile insurance companies have concluded plans for a nation-wide extension of their detective bureau. The bureau already has branch offices in a number of cities in the East.

The report made by the bureau for the fiscal year ended Feb. 1 shows that the automobiles stolen during the year had an insurance value of \$5,000,000.

Men of the Industry

H. B. Edwards, who in the horse days was Detroit manager for a buggy company, has been made Detroit branch manager for the Studebaker Corp. of America. Edwards is well known in Detroit and two of his old clerks in the buggy store were Barney Everitt and H. S. Firestone.

W. J. Norwich, general manager of McMullen & Lee Co., Ltd., Studebaker distributors in Toronto, has resigned to become sales manager of the Disappearing Propeller Boat Corp., formed recently to merchandise standardized motor boats.

Frank H. Wilson, who during the war was chief of production for the Detroit office of the government air service, has been appointed supervisor of purchasing for the Lincoln Motor Co. George E. Carpenter will remain with the company as assistant to Wilson.

W. Colburn Standish, for a number of years head of the United States Tire Co., Detroit branch, has left that organization to enter the lumber business and will become treasurer and sales manager of the W. A. C. Miller Co.

James A. Braden, advertising manager of Standard Parts Co., will sever his connection with that company May 1. He will be succeeded by Ralph W. Leavenworth, formerly assistant manager.

Arthur Kirkland, former sales engineer of the Detroit Tool Co., is now manager of the Cleveland office. He will be in charge of sales of the Sanford Precision Centerless Cylindrical Grinding Machine.

C. E. Canright, who for five years has been associated with an automobile equipment factory in Milwaukee, has been made sales manager of Kol-Ben Wheel Co., at Cadillac, Mich.

L. M. Van Riper has been named Michigan district manager for the Ajax Rubber Co. of New York, with headquarters in Detroit. His territory also includes all of northern Ohio.

A. R. Barbier, formerly with Packard Motor Car Co. and Power Alexander & Jenkins, has joined the staff of Frank Eastman, advertising manager of Lincoln Motor Co.

George Zwergle, formerly factory representative of the Republic Truck Co., has been appointed director of sales for the newly-organized Transport-Utilitor Sales Co., in Toledo.

L. D. Graham, formerly wholesale distributor for Apperson Bros., has been made general sales manager of the Denby Motor Truck Co., succeeding Percival Dodge.

C. D. Fleming, for several years in charge of cost accounting for the Studebaker plants in Detroit, has been made treasurer of the Cleveland Tractor Co., in charge of finance and accounting.

Alfred Lucking, general counsel for the Ford Motor Co., has resigned from that post but will continue as personal attorney to Henry Ford.

Charles E. Roney has been named sales manager of the Starkweather Co., distributors of Artcraft tops in Michigan, northern Ohio and Indiana.

George A. Stracke has taken charge of the advertising department of the Standard Motor Truck Co. Stracke formerly was with Campbell-Ewald and recently has conducted a retail agency in Saginaw.

D. W. Burke and W. J. Burns have organized the Automotive Engine Parts Co., to handle official distribution of Continental engines and Borg & Beck clutch parts for Michigan.

T. O. Stapler has been elected vice-president of the Missouri Moline Plow Co., of St. Louis.

T. M. Russell, president of the Russell Mfg. Co., has been elected president of the Middletown, Conn., Chamber of Commerce.

O. S. Barrett has been appointed advertising manager of the Studebaker Corp., automobile division, South Bend.

T. S. Lindsey, formerly New York branch manager and eastern district manager of the Kelly-Springfield Tire Co., has been made a special representative of the company's sales department.

Vernon E. Bush has been named manager of the export sales division of the Republic Motor Co., Inc., Alma, Mich.

Raymond E. Plimpton, formerly publication manager and field secretary of the society of Automotive Engineers, has joined the Sales Advertising Co., of New York.

Maxwell C. Maxwell, formerly assistant general superintendent of the Yale & Towne Manufacturing Co., has been named general superintendent.

FISK DINES OFFICIAL

SPRINGFIELD, MASS., April 17—Everett M. Bogardus, controller of the Fisk Rubber Co., who is to remove to New York as an associate of H. T. Dunn, president of the company, was given an informal dinner this week at the Oxford Country Club, Chicopee Falls, by 40 of his colleagues. Guests included officers of the company, many of the department heads and Col. A. F. Foote of Holyoke, head of the state department of public safety. Mr. Bogardus, who has been with the company for more than a quarter-century, was given a diamond scarfpin.

ASPHALT ASSOCIATION MEETS

NEW YORK, April 16—George Otis Smith, director of the United States Geological Survey addressed the annual meeting of the Asphalt Association at the Engineers Club here this week. He stressed the importance of considering

the production of petroleum and its by-products from the standpoint of quantity rather than cost. He pointed out that while there has been an increase each year in the production of petroleum the demand always outruns the increase. Director Smith characterized paving as essential to the transportation system of the country. Reports which were presented showed that in 1919 approximately 60,000,000 sq. yds. or about 6,000 miles of asphalt pavement was laid in the United States.

J. R. Draney of the United States Asphalt Refining Co. was elected president of the association.

Frank New President of Rauch & Lang

CHICAGO, April 16—Paul A. Frank has retired from the Magnetic Motors Corp. to become president of Rauch & Lang, Chicopee Falls, Mass., manufacturers of electrics. He is only 32 years old and will be one of the youngest automobile executives in the country. He started his business career as a motor car salesman.

Frank and Ray S. Deering, who recently was elected president of the Stevens-Duryea Co., formed a partnership five years ago to deal in used electric automobiles, beginning in a modest way. They soon added other lines and took on the agency for Rauch & Lang. Later they added the Owen Magnetic and just before the war began manufacturing a magnetic car of their own called the Deering. The war made it impossible for them to make contracts for parts and accessories, however.

Both Frank and Deering will retain an interest in the retailing business of the Deering Magnetic Co. in Chicago, but the active management has been turned over to Bruce E. Adams, who is succeeded as sales manager by Richard S. Griefen.

WELDING SOCIETY MEETS

NEW YORK, April 22—The annual meeting of the American Welding Society is being held to-day in the Engineering Societies building. The business session, with a discussion of proposed amendments to the constitution, and election of officers, took up the morning hours. The afternoon meeting will be devoted to a discussion of welded joints for pressure vessels. Three papers will be read at the evening session. They will be "Speed of Metal Arc Welding," by William Spraragen, University of Washington; "Automatic Arc Welding Machines," by H. L. Unland, General Electric Co., and "Recent Development in Gas Cutting," by Stuart Plumley, of the Davis-Bournonville Co.

CIVILIANS BUY PLANES

NEW YORK, April 16—Henry Woodhouse, president of the Aero Club of America, announced in his annual report that civilians have acquired about 4000 surplus military airplanes in the last nine months.

Calendar

SHOWS

Oct. 6-16—New York. Electrical Show. Grand Central Palace. George F. Parker, Manager.

Dec. 10-18—New York. Motor Boat Show. Grand Central Palace.

FOREIGN SHOWS

May 15-June 13—Cars, Parts and Accessories. Antwerp.

June 26-July 25—Commercial vehicles, tractors, camions and engines. Antwerp.

July 9-20—London, England. International Aircraft Exhibition. Olympia. The Society of British Aircraft Constructors.

Aug. 7-Sept. 15—Motorcycles, sidecars, etc. Antwerp.

October—London. Commercial Vehicle Show. Olympia.

November—London. Passenger Car Show. Olympia.

CONTESTS

May 1—Hanford, Cal. Dirt track.

May 31—Indianapolis, Ind. Speedway.

May 31—Brockport, N. Y. Dirt track.

June 1—Omaha, Neb. Truck Reliability Run.

June 12—Uniontown, Pa. Speedway.

June 17—Portland, Ore. Dirt track.

June 19—Ogdensburg, N. Y. Dirt track.

July 4—Tacoma, Wash. Speedway.

July 4—Hanford, Cal. Dirt track.

July 4—Spokane, Wash. Dirt track.

July 5—Batavia, N. Y. Dirt track.

July 17—Warren, Pa. Dirt track.

July 24—Watertown, N. Y. Dirt track.

July 31—Fulton, N. Y. Dirt track.

Aug. 7—Erie, Pa. Dirt track.

Aug. 14—Buffalo, N. Y. Dirt track.

Aug. 20-21—Middletown, N. Y. Dirt track.

Aug. 31—Johnstown City, Pa. Dirt track.

Aug. 28—Canandaigua, N. Y. Dirt track.

Aug. 27-8—Flemington, N. J. Dirt track.

August, 1920—Paris, France. Grand Prix Race. Sporting Commission Automobile Club of France.

Sept. 1—Glidden Tour—N. Y. to San Francisco.

Sept. 5—Targa Florio Race, Sicily.

Sept. 6—Hornell, N. Y. Dirt track.

Sept. 6—Cincinnati, O. Speedway.

Sept. 6—Uniontown, Pa. Speedway.

Sept. 17-18—Syracuse, N. Y. Dirt track.

Sept. 25—Allentown, Pa. Dirt track.

Oct. 1-2—Trenton, N. J. Dirt track.

Oct. 8-9—Danbury, Conn. Dirt track.

CONVENTIONS

April 27-29—Atlantic City. Increased Production Convention, Chamber of Commerce of the United States.

April 29-May 1—Detroit, Mich. Fourth Annual Meeting and Convention, American Gear Manufacturers Ass'n.

May 9-12—Independent American Petroleum Congress, Congress Hotel, Chicago.

May 12-15, 1920—San Francisco. Seventh National Foreign Trade Convention.

May 20-30—Atlantic City. Third American Aeronautic Congress. Aero Club of America.

May 24-26—Indianapolis. Service Managers' Convention. National Automobile Chamber Commerce, Service Division.

June 7-10—Indianapolis, Ind. Annual Convention of the Associated Advertising Clubs.

June 7-11—Del Monte, Cal. Automotive Equipment Association, Directors' Meeting, 7-8; General Sessions 10-11.

June 22-25—Asbury Park, N. J. Annual meeting American Society for Testing Materials.

S. A. E. MEETINGS

June 21-25—Ottawa Beach, Mich. Summer Conference.

Mason Plans Housing for Girl Employees

KENT, OHIO, April 16—A dormitory which will contain 20 five-room apartments will be erected by the Mason Tire & Rubber Co., to house properly the girls who will be employed in its textile division. The dormitory will cost approximately \$100,000.

Each five-room apartment will have a kitchen, a dining room and a living room on the first floor, and two bedrooms and a bath on the second floor, with a laundry in the basement.

The plans of the dormitory are distinctive in that they provide for the housing of the girls in small families where they can live economically and in family style.

There is to be one large room in the center of the dormitory, where social events, dances and any general function can be held by the girls living in the dormitory.

Plans have been drawn and construction is to start at once upon a welfare, labor, employment and time-keeping building, to be located just east of the restaurant. This building will have rooms equipped with shower baths both for men and women.

The Mason company is making extensive additions to its plant. The textile division already has been completed and several other buildings will be started at once.

LA CROSSE FOUNDRY TO OPEN

LA CROSSE, WIS., April 19—The Automotive Foundry Co. of La Crosse, Wis., a new \$100,000 corporation, is pushing work on a new gray iron foundry, 100 x 220 ft., the output of which will be absorbed largely by the La Crosse Tractor

Co., which thus will be able to greatly enlarge its output, restricted to some extent by the difficulty of obtaining an adequate supply of castings from present independent sources. O. B. Dibble is president, and A. A. Rasmussen, secretary and works manager of the Automotive Foundry Co.

Western Syndicate Plans Air Service

CINCINNATI, April 16—The Western Air Line Syndicate has been organized in Cincinnati for the purpose of placing airplane transportation lines in operation between the cities of the Middle West. The capitalization is \$2,000,000 and a charter will be asked of the secretary of state next week.

Contracts for carrying the United States mails will be sought by the new company. Fred M. Renshaw, traffic department of the Chamber of Commerce, is working with the Chamber of Commerce in other Middle West cities to ascertain from manufacturers just what tonnage is available for these lines and its class.

Those who joined in organizing the company included officials of the Cincinnati Aircraft Co., members of the Chamber of Commerce of Cincinnati, and the following out-of-town men: O. C. Johns, Erie; F. C. Wells, Chicago; W. A. Hubbard, Louisville; Frank Bernstein, Indianapolis; C. C. Berry, St. Louis, and G. F. Thomas, Cleveland.

LAKES TRUCK LINE STARTS

DETROIT, April 17—Diamond T Motor Car Co. of Chicago, is operating a regular fleet of trucks between the Windy City and Detroit, the first units of the fleet reaching Detroit yesterday.

Brooklyn Products Shown at Exhibit

NEW YORK, April 19—A score or more of Brooklyn manufacturers doing an automotive parts or equipment business exhibited at an industrial show held last week in the 23rd Regiment armory, that city. There was no effort to feature the automotive side of the city's manufacturing exhibitors showing specialties in their own particular lines.

Among automotive exhibits were Klaxon, showing horns; Curran radiators, Caille Liberty drive motors for boats, the Generator Valve Co., James carbureters and tire pump. John Polachek, bronzes; Murcott and Campbell, files; Penn Brass & Bronze Co., Adriance Machine Works, showing a staggered feed press; Duplex Engine Governor, Merrill Bros., drop forgings; E. W. Bliss, Doehler Die Casting Co., Taylor & Co., Beach Russ & Co., cutting machines; Thomas Paulson & Son, castings, Hecla anti-friction bronze; William Vogel & Bros., cans; E. Reed Burns Supply Co., Hay Hudden Mfg. Co., anvils.

T. R. Brawley, Eastern Tube & Tool Co., Eisemann Magnete Co., Estey Bros., Fairbanks, Morse & Co., Fulton Foundry & Machine Co., Greenpoint Belting Co., Hilo Varnish Co., Irving Iron Works, Laurence Belting Co., New York Leather Belting Co., the Peelle Co., Reliance Metal Spinning & Stamping Co., Inc., J. W. Richardson Foundry & Metal Corp., the V. & O. Press Co., Valentine & Co., William Vogel & Bros., Inc., Wahlstrom Tool Co., and J. H. Williams & Co.

The exhibit was opened on Monday by H. H. Doehler, president of the Doehler Die Casting Co., his associates in this ceremony being Frank H. Moses, of the Adriance Machine Works, and J. O. Skinner, of the E. W. Bliss Co.

AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

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No. 18

Starting the Standardization of Hub and Axle Design

A campaign for this necessary and important work was started by Mr. Schipper in *AUTOMOTIVE INDUSTRIES* of April 1. Since that time, he has received many letters and communications emphasizing the desirability of the course he proposes. This article points out how and why this vexatious problem should be attacked immediately.

By J. Edward Schipper

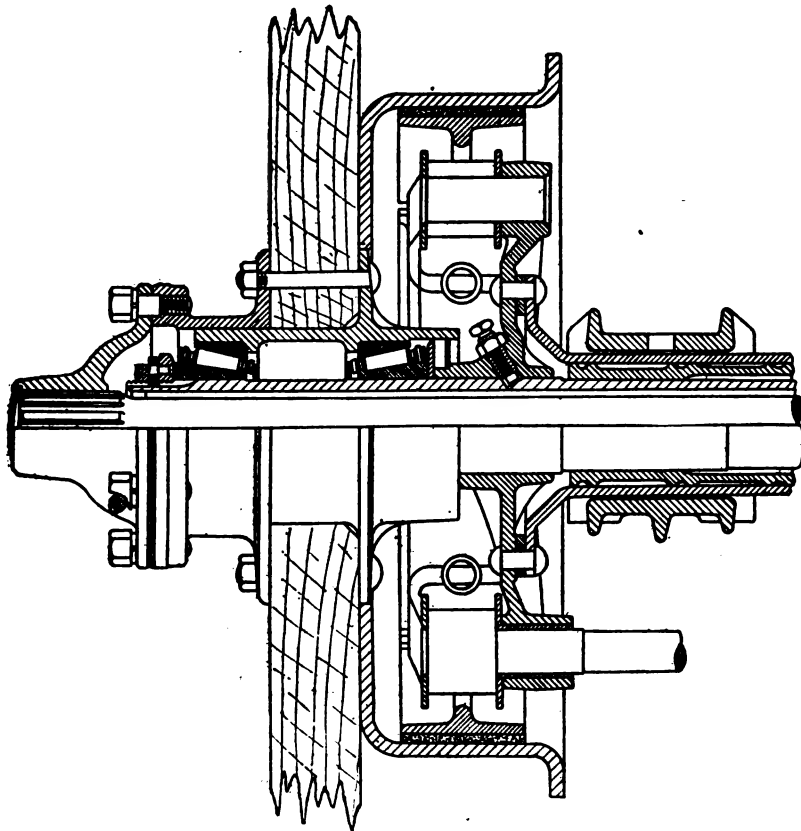
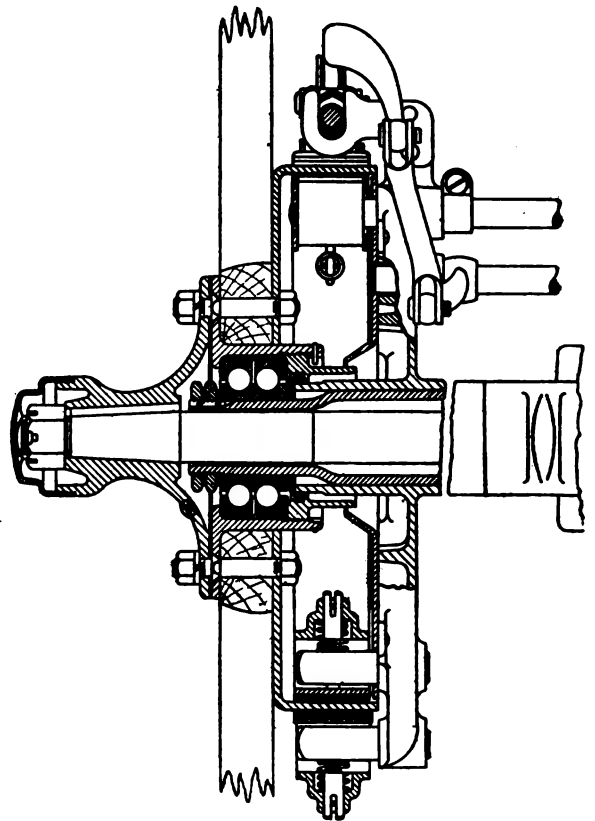
AN immediate start should be made on the matter of truck hub standardization. This is evidenced by the fact that there is probably more interest in the subject now than there has been in any standard in the history of the automotive industry. It is a critical time, particularly in the truck field, where new equipment is being designed to take care of the coming series of pneumatic-tired commercial vehicles.

While there is only a remote possibility that the ideal ever will be reached, some dimensions could be standardized almost at once, with a little co-operation among the axle manufacturers. The hub flange diameter, the hub bolt circles and the widths of spoke are three factors which lend themselves readily to standardization and which vary at present through a considerable range. No more than one or two axle manufacturers would be penalized to any extent by the standardization of the hub flange and in their cases it would be necessary only to add a small amount of metal to take care of the slightly increased diameter.

There is a tendency among the axle makers

to stand pat and to say that standardization beyond the possible three items just mentioned would not be desirable, inasmuch as it would tend to throttle development. This stand is not justified in view of the immense cost to the industry by lack of standardization on these parts. Where individuality of design costs the industry as a whole a great amount of money, it would be better to have the part standardized, even though some features of the design were not ideal, as the eventual cost would be less not only to the manufacturers as a whole, but to the ultimate consumer.

When all is said and done, the interest of the industry, taken at large, is best served when the ultimate consumer is best served. The ultimate consumer is best served when he obtains the most satisfactory product for the least possible expenditure. In regard to axle hubs, we know that some of the cheapest hubs to construct are used on the most expensive and most satisfactory trucks. With this in view, it is logical that individuality could well be sacrificed to bring the industry toward a more standardized basis.

*Timken full floating rear axle**Salisbury rear axle*

Nothing about a hub design is exceptionally intricate. There are many satisfactory types and few, if any, unsatisfactory types, as regards performance. As regards design and manufacture, however, some types are more expensive and intricate than others and, although it seems almost presumptuous and possibly extreme to suggest it, there is every reason to indicate that a strenuous effort should be made to get the axle builders together to determine if it would not be possible to co-ordinate many of the ideas now being used, as regards bearing spacing, mounting, etc. The bearing manufacturers themselves are vitally interested, particularly in cases where the outside diameters of the bearings vary within a few thousandths of an inch.

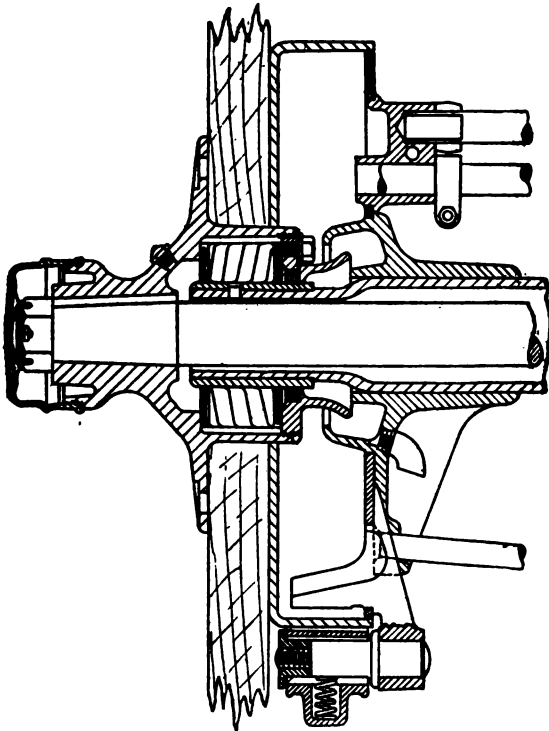
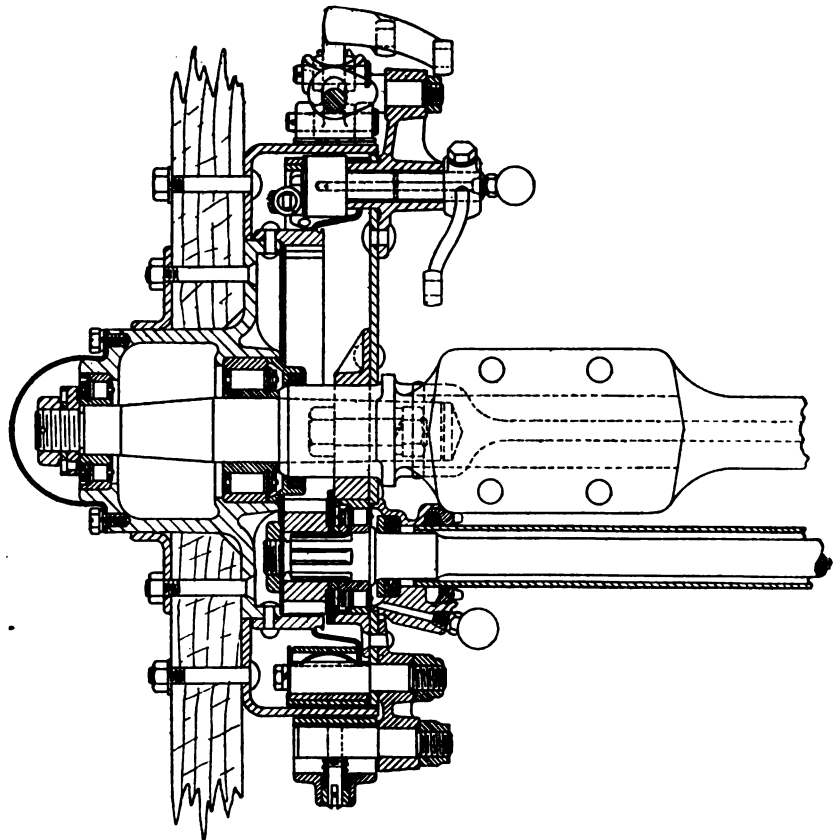
It is the belief of many in the industry that, if the axle manufacturers once made a start to the extent of standardizing the hub flange, bolt circle and spoke width, it would be possible gradually to go farther. It will not be possible to do this in a day and likely we always will have several types of rear axles for both passenger cars and commercial cars. For the commercial car, we have the internal gear types of axle added to the design usually used in passenger car practice.

It is readily realized that it is not possible to go back and alter designs which have been used in the past and for which the wheel makers have already largely equipped themselves in the way of patterns, jigs and tools. On the other hand, right now is the time when the problem should be studied, particularly in the commercial vehicle field, where the new pneumatic equipment is about to be designed. It would be unfortunate if the unstandardized condition prevailing in the present solid tire axle, should

be repeated with the pneumatic equipment. Furthermore, it is an injustice to the wheel manufacturers, wood or metal, to force upon them the necessity of assuming the expense of pattern and manufacturing equipment for a great variety of axles when, with proper co-operation among the axle firms, it would be possible considerably to reduce the necessary number. In the solid tire situation, we not only have the variety of axles, but we have all the different types of wheel equipment to take care of the small and large, single and dual tires.

At this time, and probably for several years to come, the problem of the truck and passenger car manufacturer is not where to buy his parts but how to get deliveries. In other words, there is not a parts maker who has not ahead of him all of the business that he can take care of. He has no necessity for sewing up any individual manufacturer with designs of such an unstandardized character that they make it practically impossible for him to change his source of supply. In other words, there are no selfish reasons which will stand the light of investigation why manufacturers cannot co-operate. It may not be desirable or necessary that the axle makers should discard their individual preferences as to design but it is highly desirable that, where particular dimensions vary by a small amount, these should be made in the future to coincide wherever possible. It also seems desirable that some of the manufacturers who are clinging to designs originated a great many years ago, should revise them to the simple and proven types of more up-to-date usage.

Wheel makers generally are looking with great concern toward the pneumatic-tired truck wheel situation. They have been through the expense of buying special pattern equipment, machining tools and jigs for each size and make of axle for the solid-tired truck, as well as for the passenger car. Naturally they fear the great

*Weston-Mott rear axle**Torbensen internal gear rear axle*

variety of axle and hub designs probable with the pneumatic development, particularly as it seems likely that, in developing the pneumatic-tired machine, practically all parts of the truck will be materially affected.

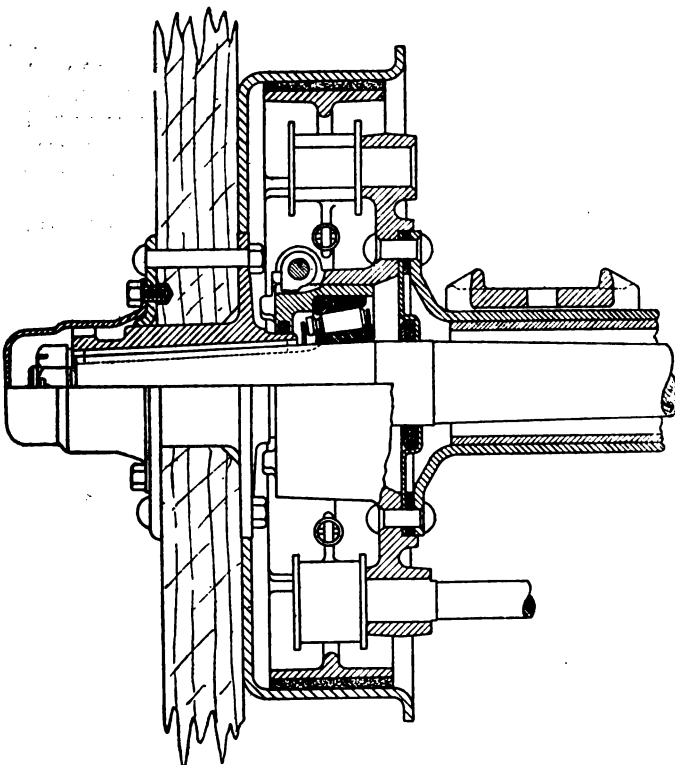
Since the wheel industry is affected as seriously as it is, it seems no more than fair that the axle manufacturers should work with the wheel makers in an effort

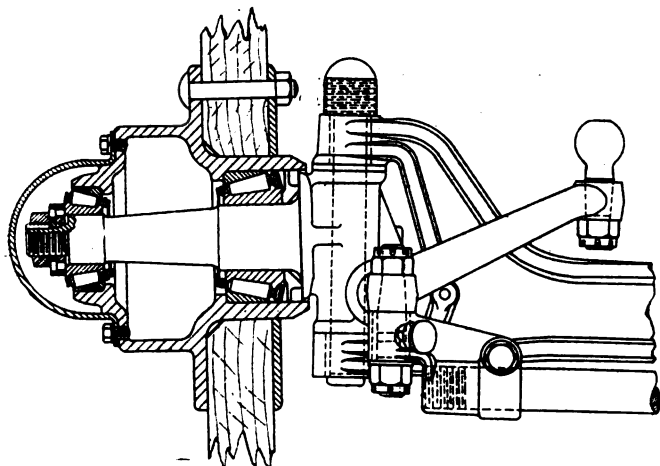
to simplify the situation as far as possible. There are points which can be readily cleared away and there are others which are going to be extremely difficult but every step taken will result in the saving of thousands of dollars, which ultimately has its effect on reducing the cost of the product to the consumer and incidentally leads to increased demand and increased business for the manufacturers.

The tire and rim phase is not in as chaotic a state as the hub, and the problem is not so complicated, but there is much to be done. For example, the width between the inclined faces is different on the five sizes of rims for pneumatics and, consequently, calls for different facings in each case on the wheel felloe. There seems to be no logical reason why the distance between these surfaces should not be the same on all of the rims. Probably the tire maker fears there would be a temptation to under-tire the truck, but it would seem there would be other means for preventing this. It would also be possible to go further toward standardizing the bolt circles for the demountable rim retaining lugs.

To sum up the situation, it is a joint problem concerning the axle manufacturer, the tire manufacturer, the wheel manufacturer and the bearing manufacturer. They are all vitally interested. It starts with the axle maker, who is in the key position. Whatever he decides must serve as a guide to the others, because they are making the equipment that goes on the axle manufacturer's original design.

As pointed out, it is not desirable, or is it suggested, to change past equipment, but it is suggested that now, when the pneumatic tires for trucks are coming strongly to the front, co-operation in design should be extended by each of these four classes of manufacturers to the eventual reduction of cost to all and correspondingly to the

*Timken fixed hub rear axle*



Torbensen front axle

truck buyer. It is a give-and-take proposition, with no real loss to anyone, but eventually it will prove a gain to all, because of the increased business which always results from a reduction in cost.

It will be necessary for some of the axle makers, particularly, to take an exceedingly broad view of this situation but it is just as evident that it will react to their benefit. The hub situation, particularly, should be straightened out as much as possible, as every different hub puts a burden on every wheel manufacturer who desires to make wheels to fit it. Each one must tool for that particular hub at a cost ranging anywhere between \$2,000 and \$4,000 or \$5,000. If there are twenty wheel manufacturers making wheels for that particular hub, there is a possibility of \$100,000 being sewed up simply

in the equipment to manufacture wheels for it and, if we run to sixty or seventy varieties, as is now the equipment of the average wheel concern, it is easy to see the millions of dollars that are tied up simply because of the stand-pat attitude on the part of manufacturers.

There is no great sacrifice of individuality required, because, in the first place, the amount of money saved in co-operation is far greater than would be the benefit accruing from any individuality of design, no matter how brilliant it turned out to be. The front wheel and axle situation is particularly accessible. Here it comes down in a great many instances to simply a question of bearing spacing and these only vary a few thousandths of an inch on a great many designs.

On the rear axles, there are some greater problems which have to do with the different types of final drive but it would be possible to reconcile a great many features in similar types of axles of different makes. Were it not for the fact that whatever the axle manufacturer does puts the burden on the wheel builder, the problem would not be as acute. For instance, we would not think of standardizing the type of final drive between propeller shaft and rear axle. Whatever the manufacturer does on this is an individual problem affecting no one but himself and the user of his product. When he designs an axle, however, every wheel manufacturer in the country who wishes to produce wheels for that type of axle must equip himself to manufacture the wheel mountings and this ties up the great sums of money in patterns, jigs and fixtures. The problem should be attacked vigorously because of the coming crop of new axle designs. Now is the time when every executive should scan his product to see if it could not be simplified, not only for himself, but for the other manufacturers who make corresponding parts.

The Use of Hickories in Vehicle Building

THE principal species of hickory are divided botanically into two groups—true hickories and pecan hickories. True hickories include shellbark, shagbark, mockernut and pignut or black hickories. Pecans include bitternut, nutmeg, pecan, and water hickories.

The chief difference between true and pecan hickory, as shown by tests at the Forest Products Laboratory, is in toughness or shock-resisting ability. This is the property which is so valuable in wood handles and vehicle parts. In this property, true hickories are far superior to the pecans.

The strength properties of pecan, according to the laboratory tests, are somewhat in excess of those of oak or maple, and for such articles as handles and spokes, carefully selected pecan is probably to be preferred to either of these two woods. In heavy wagon parts, maple and oak are reputed to stay in place better than hickory. Except in case of extreme shortage of maple, true hickory, and oak, it would probably be inexpedient to use pecan hickory for these heavy parts.

The sapwood or white wood of hickory, which is usually preferred by the trade, is the better wood in young, thrifty trees but in over-mature trees it is inferior to the heartwood. A red color does not necessarily make sound hickory unsuitable for vehicle stock.

A more useful criterion than color is the proportion of summerwood, or nonporous wood, in the annual growth

rings. In hickory stock intended for the more exacting uses, the nonporous wood should form at least one-half and preferably three-quarters of the annual ring; and the remaining part should contain very few pores. A further precaution to be observed is that the nonporous part of the annual ring should be hard and flinty.

The best criterion of the strength properties of either true or pecan hickory is the weight of a cubic foot of the dry wood. This weight should not be more than 10 per cent below the average for true hickory; or not less than 45 pounds per cubic foot of oven-dry wood.

The Wrapping of Airplane Struts

EXTENSIVE tests to determine the value, in gaining strength, by wrapping canvas, tape or cord around airplane struts have been completed by the Forest Products Laboratory for the Army Air Service, with the result that the practice seems to develop no beneficial results. Use was made of Sitka spruce and Douglas fir in the tests and the laboratory reports that the wrapping is of less value than the same volume of wood. Since such a covering may be heavier than wood, it was said to be of still less value when compared with the same weight of wood.

The Business Press as an Aid to Industrial Efficiency

Recognizing the business papers as a powerful factor in industry, the Chamber of Commerce of the United States held a group meeting of such publications at its Atlantic City convention. This article briefs some of the ideas and ideals expressed by the publishers and editors.

THE functions of the business press—as a stimulant to production, as a factor in co-ordinating the successive steps of manufacture from the raw material to the finished output and as an aid in bridging over the stress of the present economic situation—were outlined on April 27 at the Press Group Meeting of the Atlantic City Convention of the Chamber of Commerce of the United States of America. The discussion was headed by the publishers and editors of many industrial and business papers.

One of the speakers was M. C. Robbins, publisher of *Gas Age* and Vice-President of the Associated Business Papers. Mr. Robbins took labor conditions as his subject and outlined the duties of the business papers in righting the difficult situation now existing in that field.

"The slackening of production in many essential industries is hurting the workers along with the general public," he said. "I believe that an appreciation of this situation has reached the minds of the workers, both skilled and unskilled, and that they are genuinely anxious to do their share in righting conditions.

"There is need, however, for sympathetic co-operation between the employers, the employees and all factors entering into production. There could be no higher function for business and industrial journals at the present time than to exert their great influence toward bringing about a better understanding between these factors and in pointing the way to the solution of their common problems."

The obligation resting upon these papers was made clear by H. M. Swetland, President of the United Publishers Corp. and of the Class Journal Co., which publishes *AUTOMOTIVE INDUSTRIES*. He was general chairman of the press meeting. Mr. Swetland stated that the American industries are being carried "largely by the stimulation of a war market" and that "this inflation must be faced in one of two ways—either a wholesale reorganization is involved or production must be increased to meet this inflation." The present level of living costs, he believes, will not be reduced until a higher efficiency is attained by the producing forces of the country and, naturally, of the world.

"No greater obligation ever rested on any phase of industrial existence than rests to-day upon the press of this country, whether the publications

are secular, educational, general or industrial. The necessity of economic production must be told and retold. The publisher, standing in the perspective vantage ground, can foresee and foretell better than any individual operator the necessities confronting the great industries. He must utilize his organization for careful investigation, familiarize himself with the economic processes, and he then must be fearless in his denunciation of improper methods and practices."

The raw material situation was taken up by Charles H. Clark, editor of the *Textile World Journal*. He declared that higher co-ordination between producer and user was necessary.

"The most highly developed modern types of big business have not only frequently lost their sympathetic touch and relationship with labor but also with the producers of their raw materials," he said. "An adequate and continuous supply of labor and raw materials is essential to the conduct of any business and lack of such co-ordination and control is an important cause of interrupted production and high costs."

Another potent factor in the difficult situation as it exists to-day is that of transportation. It was taken up by Roy V. Wright, managing editor of *Railway Age*.

"Railway transportation is to-day the limiting factor in production," Mr. Clark declared. "In many of the industries of this country, this condition, acute as it is in some respects, promises to continue for a considerable time. The underlying causes for this shortage of transportation are the lack of sufficient equipment and facilities and the low morale which now exists among railway workers.

"The lowered morale among the employees is not very different from that existing to a greater or less extent throughout the business and industry of this country. Increased production and a lower cost of living will not be brought about until this condition is changed. The business papers have a distinct responsibility in educating the men in their respective fields to the necessity of doing their part in raising the morale of the forces generally; this will react favorably upon the railroad field."

Others who addressed the Press Group Meeting were Charles H. Phillips, President of the *Dry Goods Economist*; Arthur J. Baldwin, Vice-President of the *American Machinist*; John H. Fahey, publisher, of Boston, and Merle Thorpe, editor of *Nation's Business*.

The Commercial Airplane in Its Present Day Development

Throughout the period since the armistice, the plane builders of Europe and America have striven for reliable and economical machines to undertake the tasks of industrial transportation. This review records some of the achievements in this field, revealing the advancement of the past months.

By George E. Quisenberry

AIRPLANE development since the armistice halted the military programs has been largely a search for commercial models combining high carrying capacity with steadiness and reliability of operation. Such a course has been a natural one that could scarcely have been otherwise when the financial factors determining peace-time production are taken into consideration. The airplane builders, not only of the United States, but of Great Britain, France, Italy and Germany as well, have attempted to construct machines, taking their war-time lessons as a basis, that would be feasible for passenger and express enterprises, thus establishing the markets that would enable them to keep their factories in operation.

Many of these higher-powered machines have been announced within the last few months and some of them have reached the production stage, although a few have not completed their test flights. But the engineering work already accomplished is of wide scope and is prophetic of a future in which huge planes carrying large cargoes are a reality. Whether the best type for such a machine has been evolved, remains a matter of debate, but it is evident that the designers have traveled far in their almost unsupported efforts to solve the problems of air transport.

A review of the larger ships that have come out of the world's plane factories since the armistice, constructed as a result of peace-time competition rather than the urge of military necessity, shows that certain types and certain tendencies are becoming almost standardized. Although the various makers have brought out ships according to their own ideas of construction, the range of these models is not high. A composite would approach closely an average type from which the deviation of the individual maker is small.

This average machine would be a biplane, mounting two tractor engines of a fixed type on either side of the center nacelle or fuselage in which the passengers or cargoes are carried. This is the construction that Curtiss, Martin, and Lawson, in America; Vickers, Handley-Page and Grahame-White, in England, and some makers in France, have used for their large passenger ma-

chines. Caproni in Italy; the Airco machines, in England; Bleriot, in France; Thomas-Morse and L. W. F., in the United States, and Aviatik, Linke-Hoffmann, Siemens Schuckert and others, in Germany, have developed different lines. But, throughout most of the transport machines of the post-war period, a current of somewhat similar design may be traced, and the fixation of models shows that wise construction already has been attained by the industry's engineers.

This article will attempt to group a few of the apparent tendencies with a study of some of the newer machines. Although most of the machines have been described previously, no attempt has yet been made to consider them as a group. Development of the smaller sport and military planes will scarcely be touched, and only those machines will be considered that seem to have a commercial future.

Basic principles, at least, have undergone but few variations from the military effort, except as greater capacity and more reliability have been worked out. Numerous changes and rearrangements of engine fittings and mountings, together with refinement of parts, have been made. Engine powers have grown higher and the installation of more engines has kept pace with the race for larger capacities, excepting that in America no civilian plane has carried more than three power units and only one seems likely to continue with more than two.

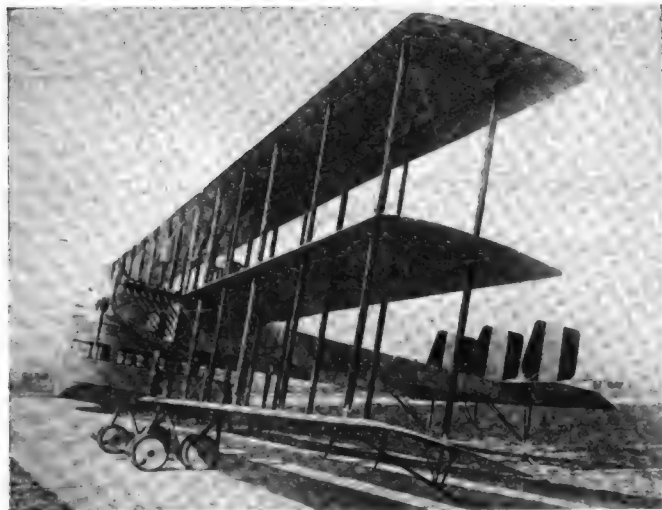
Wing and tail structure, so far as fabrics and such materials are concerned, have undergone almost no change. Only the Germans have gotten far with the all-metal structure and, although the manufacturers of every country have watched the Germans as closely as



The Airco nine-passenger single engine plane designed for the London-Continental service

has been possible under the chaotic conditions existing in the former Kaiser's realm, no other nation has produced a commercial plane of such material. The British, according to a recent report, have constructed a small military plane, equipped with an Hispano-Suiza, 200-hp. engine, along the German lines, but little is known of it here.

The American military service also has been reported as experimenting with a metal fuselage plane but having fabric wings.



One of the Caproni triplanes having a seating capacity of 20 passengers. This design has been modified or changed so that several other models resemble it closely

Technical knowledge concerning the Junker, as the German metal plane is known, has been circumscribed and only recently have descriptions of it appeared in this country. As will be remembered, the only plane of this type believed to have reached America was wrecked in its trial flights on Long Island. Future construction along such lines can be guessed at only and it would be dangerous to predict that the world's makers soon would desert the fabric-covered construction that proved out so well during the war.

The big passenger machine has remained almost entirely of biplane form. Caproni, it is true, has gone into the construction of the three-surfaced type, with one triplane at least seating as high as forty passengers, in addition to numerous of smaller size and a larger one, partially built, to carry 100 passengers. The Tarrant Aircraft Construction Co., of England, according to an American trade paper, also has designed a large triplane, which would carry six Napier engines totalling 3000 hp., but its details are not available. Consequently, the Italian—and his ability is admitted and his talent recognized throughout the airplane industry—appears to be almost alone in taking up the triplane type, although, in doing so, he seems to have pushed the weight-carrying capacities to limits approached only on paper by other designers.

One reason, perhaps, for clinging to the older and better known biplane has been that wing structures and supporting surfaces were so well developed during the war that little change has seemed necessary. The fabric-covered biplane proved its worth long ago; its forms have become more or less standardized, and the necessities for obtaining reliability and economy of operation have concerned more importantly the powering factor. Wing structures, as now employed, are of such excellence that they do not determine the life or ability of the machine, as they seldom fail, and, except in crashes due almost always to other causes, the lifting surfaces seldom go to pieces.

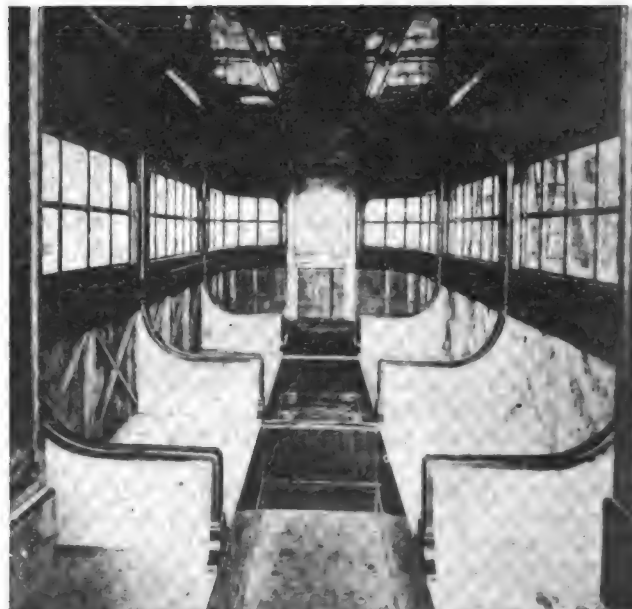
The knowledge and science of wing part construction has, of course, grown more thorough during the post-war period. The resultants of more rigid streamlining, to mention one obvious but important factor, are better known and its principles are being more intelligently applied than during the rush construction of the war. But, after all, the efforts of the designers have not been applied primarily to such studies—in the main, the more

necessary and valuable lessons of the last few months have concerned the power "heart" of the machine.

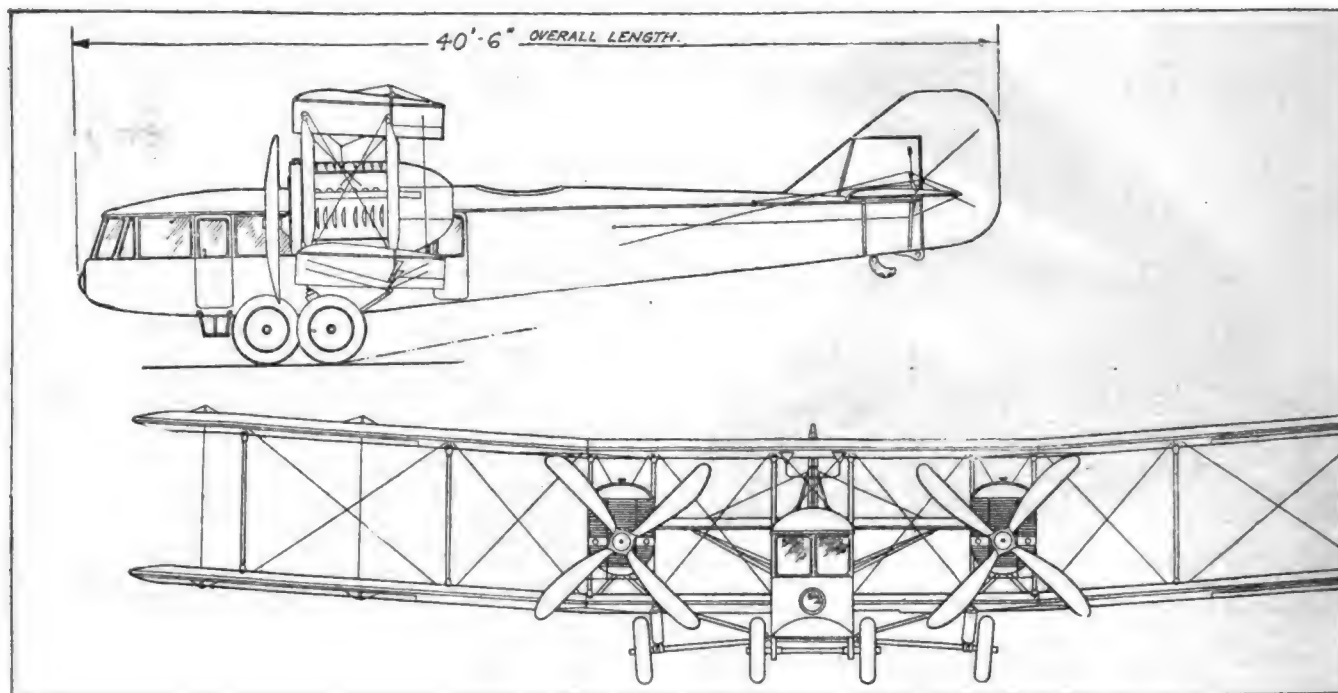
The transport planes have employed almost entirely the stationary engine, and Caudron and Farman, in France, have been alone in using a radial type, the power being furnished by three Salmsons for the former and two of the same make for the latter. The other large ships, leaving out the Germans, have been powered with engines of Liberty, Curtiss, Hispano, Rolls-Royce, Napier or Fiat construction, water-cooled, and of Vee or vertical design. The tendency in America has been the same as that of Great Britain, France and Italy in that respect, although it seems that the Europeans have sought for higher power in single units than have the Americans. This was revealed at the Paris air show in the exhibition of several sixteen- and twenty-four cylinder models and one, the Bugatti quadri-engine group, drove a single shaft and a single propeller with a 32-cylinder mounting.

A line of development that has been followed out extensively in Germany is the construction of large, multi-engined machines with the powerplants enclosed in the fuselage and the propellers driven by some form of gearing. This has been worked out in two ways—one in which a single large propeller is driven by the engine group and the second having several propellers distributed between the wings. Several giant machines mounting four engines and a single propeller have been built by Linke-Hoffmann of Breslau. The Deutsche Flugzeug Werke has constructed a number of models with four engines enclosed in the fuselage, driving four propellers through a series of gears and drive shafts. At least six machines of Siemens Schuckert design have each carried six 300-hp. Maybach engines driving four propellers through gears and shafts.

In the United States, five designers have come out with large transport machines for civilian use—Curtiss, with the ten-passenger Eagle; L. W. F., with its ten-ton Owl; Martin, with a twelve-passenger model; Thomas-Morse, with a mail ship of interesting design, and Lawson with the twenty-six-passenger transport. The Eagle mounts two C-12 Vee-type engines in nacelles on either side of the fuselage. Thomas-Morse is powered with two 300-hp. Vee-type Wright-Hispanos, one as a pusher and one a tractor in the center nacelle. The L. W. F.



Passenger compartment of the Caproni triplane



Plan views of the proposed Grahame-White nine-seater limousine. These plans were taken from "Flight," published in England

Owl has three tractor 400-hp. Liberties. Martin and Lawson each fit two Liberty engines in practically the same manner as the Eagle.

That covers the American planes of large commercial possibilities. The Eagle formerly fitted three six-cylinder engines of Curtiss design, but that was changed for the present two-engine mounting, the result being a more powerful and steadier ship. Of the American machines, Thomas-Morse probably is the more distinctive, as the front and rear engine mountings, the two side fuselages containing the pilot seats and supporting the tail group, are not duplicated. Its two-wheeled landing gear is unusual in the size of the wheels, but otherwise it is largely conventional. The Curtiss, Lawson and Martin passenger bodies are not unusual, the construction differing only in details from that of numerous European makers.

The L. W. F. Owl is another story altogether. It mounts three Liberty engines in the center nacelle and two outer fuselages, the two latter parts comprising most of the cargo space and supporting the tail groups. Its six-wheel landing gear, considering also the shock-absorbers, is of an unusual design, and the tire sizes are at least of astonishing dimensions. It is understood that this machine will begin its test flights soon and, as the largest commercial plane of American make, it is to be hoped that these will prove as successful as the venture is interesting.

British construction has been much like that of America, although at least two huge passenger ships are reported under way in England that would dwarf any of the American ventures. They have become known in the United States only through rumors and may not develop at all. The two are the Vickers "Vigilant" biplane and the Tarrant triplane. The former has been reported as a prodigy of the Royal Air Force, which will carry 100 passengers and mount six engines totalling 4000-hp., a figure or fact not impossible. Little information other than that has been received about it and that concerning the Tarrant, while no more authentic, is at least a bit more detailed. It is to carry 100 passengers, like the Vigilant; fit six Napier Lion engines with a total horse-

power of 3000, and have a wing surface of 5000 sq. ft.

The Vickers-Vimy-Rolls, which made such records in the African and the Australian flights, are well known. They carry fifteen passengers or equivalent freight, have a center passenger cabin, and the two engines, which total 760 hp., are placed, like the Curtiss or Lawson, in side mountings. The landing gear consists of four wheels under the engines, with a fifth wheel under the forward part of the fuselage nose. One other unusual feature is the four-bladed propeller.

The British Handley-Page likewise is a double-engined tractor and does not depart far from the general plan of the Vickers. It would be considered at least as a similar type, although its passenger compartment shape is different and the controls are situated in a forward cockpit. The new Airco 18, which the Aircraft Manufacturing Co. has projected for its Continental service from London, is a nine-passenger machine, mounting only one 450-hp. Napier engine, as a tractor, and having only two landing wheels. It attempts a load capacity that most other makers carry with at least two power units and for that reason is unusual.

Another British machine of rather novel design is the proposed Grahame-White E-8 nine-seater, which mounts two 320-hp. Rolls-Royce, Eagle V engines. Like other British or American machines, the engines are mounted to the right and left of the center cabin. The distinctive features, according to reviews in the British aircraft journals, comprise the cabin and the landing gears. The former, which is roomy and well-fitted, extends almost 10 ft. ahead of the wings and projects well under the lower surface, but the pilot's cockpit is placed behind the trailing edge of the wings. The four landing wheels are slightly staggered, the forward pair being placed under the cabin and the remaining two are to the right and left of the fuselage, one under each engine. This machine is much like the old Grahame-White four-seater and is a high-priced ship, with elaborate fittings and finish.

Taking up the French designs, probably the most interesting is the mammoth Bleriot, seating twenty-eight persons, two more than the American Lawson. The

Bleriot has crashed twice, however, and its future is not assured. It mounts four Hispano engines, each of 300 hp., two to the right and two to the left of the center cabin and cockpit. Each engine has its individual mounting, two in the upper wing and two in the lower, on either side of the cabin. They are controlled from a forward cockpit. Eight wheels are used for the landing gear, in right and left sets of four each. The machine has the additional feature of counterbalancing the ailerons by small planes in front of the leading edge. Illustrations of it in connection with other planes, was shown on page 471 of the Feb. 12 issue of AUTOMOTIVE INDUSTRIES.

Breguet, in a machine of much smaller capacity, has incorporated a steel cabin, although other features are not unusual. Caudron, in the large biplane that is designed for thirty passengers, mounts three Salmson radial engines, in much the same manner as the L. W. F. in America. Farman mounts two Salmson radial engines in a twelve-passenger ship having a span of 92 ft.

Caproni has been the chief designer of large planes in Italy and reference has been made to his efforts. It might be added that Caproni, in his recent visit to America, predicted that airplanes would continue to grow larger and that the factors of size limitations had not been reached or even approached. He has brought out several machines with a passenger capacity of ten or more, the larger ones being triplanes, and principally mounting tractor engines. One Italian plane has been pictured in this country showing a mounting of two pusher engines in addition to the two in advance, each engine having a separate mounting, the tractors being mounted right and left of the double-decked fuselage, with the pushers still farther from the cabin. The four mountings are built into the middle of the three wings and the plane was said to have a capacity of forty persons. Some of Caproni's machines have carried landing gears of four dual wheels and some of eight. He also has designed ships in which the tail group was supported by two fuselages, as the L. W. F. Owl, and some with a single support.

Another interesting Italian design, although not so large, is the Ricci biplane flying boat. It mounts three

Isotta-Fraschini, 200-hp. engines, two being pushers mounted in nacelles on either side of the center and the third being a tractor mounted in the nose of the central nacelle. Another Ricci plane, because of its contrast, should be mentioned here. It is a sport triplane, mounting a 40-hp. Anzani engine, and having a wing spread of no more than 10 ft. 4 in. and a landing speed of 24 m.p.h.

No mention has been made of the huge American plane the Gallaudet company has projected for the transpacific flight. It is designed to carry nine Liberty engines, operating in units of three, with a single propeller for each unit. Only newspaper announcements of this development have been forthcoming and, consequently, it cannot be considered other than a possibility, albeit a most interesting one.

The most important of the German commercial planes probably is the twenty-two-passenger Aviatik, photographs and a partial description of which appeared in AUTOMOTIVE INDUSTRIES of April 15. Also a biplane, it has two tractor and two pusher engines, mounted like the Italian machine mentioned before, but differing in that the rear power units develop 550 hp. each and those in front 220 hp. each. It has forward landing wheels, somewhat similar to the Vickers-Vimy.

Other designs and other machines have been projected in the various countries under review but these may be said to comprise the most promising. What they mean to the future of aviation, thinking of it as an industry that must stand or fall because of its own ability, is simply that much of the pioneer and experimental work has been completed. With these machines as a basis, aviation should be able to stand on its own feet, admitting that the problem of aerial transport has not been finally solved but that a secure foundation has been built from which present and future business may spring.

It well may be that more economical planes, possessing higher safety factors and with engines having greater lengths of life, will be built; that is to be expected. But enough certainly has been done to show that the industry has come out of its infancy and is ready to take a place in the commercial world.

Woods for Airplane Construction

AIRPLANES have been so short-lived that it has mattered little whether the wood in them was resistant to decay. Now, with better construction and less accidental breakage of airplane parts, instances are coming to the attention of the Forest Products Laboratory of parts needing replacement because of decay.

The fact is being recognized that many woods in common use for airplanes are not resistant to decay and may be destroyed very rapidly when exposed to unfavorable weather conditions. Fortunately, according to the Laboratory, there are woods whose value in aircraft has been demonstrated which are highly durable. Among these perhaps the most notable is Port Orford cedar. Two others which in tests made by the laboratory have proved very resistant to decay are southern cypress and California redwood. Douglas fir, white oak, and black walnut stand fairly high in durability.

Mahogany and Spanish cedar are reputed to be very durable, but no tests have been made on them in the United States. Spruce, which has been the favorite wood for aircraft is, unfortunately, appreciably less durable

than any of the species mentioned. Likewise basswood, beech, birch, and maple may be classed with the less durable species.

The sapwood of practically all species decays readily. Hence in selecting wood for durability, only the heartwood should be accepted.

In cases where it is not practicable to use a naturally durable wood, the life of the wood part may be prolonged by giving it a preservative treatment. Sodium fluorid is a preservative which may be successfully used on parts that are to be glued. Coal-tar creosote, where its color and odor would not be objectionable, may be used for parts that are not to be glued. Decay in struts, propellers and some other large members can be prevented by applying a coating of aluminum leaf. This keeps the wood dry and dry wood does not decay.

ACCORDING to estimates prepared by the president of the American Car & Foundry Co., New York, railroads of the United States will need 849,500 cars during the next three years.

Effects of Water Outlet Temperature on Engine Output

The Air Service Engineering Division at McCook Field undertook a series of tests with the Liberty engine to determine the optimum water temperature. The problems involved are of unusual interest to the automotive industry. The article has just been released for publication.

ENGINEERS are well aware of the fact that there is an optimum water outlet temperature for internal combustion engines. Experiments carried out at McCook Field for the Engineering Division of the Air Service on the Liberty engine showed that a water outlet temperature of 170 deg. Fahr. is best for this power-plant. In addition to producing power equal to that obtained with any other temperature, and a slightly better fuel economy, it has the advantage of being more easily maintained under flying conditions. A water flow of 75 to 80 gal. per min. will produce the desired temperature

range of 18 deg. to 20 deg. Fahr. These conclusions are based on experiments in which one full-power run and one power run with propeller loading were made with each of the following water outlet temperatures: 110, 130, 150, 170 and 190 deg. Fahr.

On completing these runs, the standard water pump was replaced by an externally driven water pump of greater capacity. The engine was then run at the normal speed of 1700 r.p.m., with the water outlet temperature of 170 deg. Fahr. The water delivery was controlled to give a temperature rise of outlet over inlet water of 16, 18, 20, 24 and 28 deg. Fahr. At each temperature range, the flow in gallons per minute was determined on the basis of a delivery of 500 lb. into a weighing tank.

The Liberty engine used was a U. S. army standard 12-cylinder type coupled to an electric cradle dynamometer. The outlet water pipe from the engine was provided with a three-way valve, which permitted the water to be shunted into a large tank mounted on scales. The auxiliary water pump assembly operated on the centrifugal principle, a Mercedes type impeller being used, in connection with a standard Liberty pump housing. The water was admitted at the center of the housing and expelled through two outlets tangent to the impeller periphery. The auxiliary pump was driven independently of the engine by a small electric motor whose speed was controlled by a rheostat.

Results of these tests are given in the curves shown herewith. Fig. 1 shows the brake M. E. P. and brake horsepower corrected to sea level and actual fuel consumption for full throttle and propeller load operation. Fig. 2 shows the fuel consumption for different water outlet temperatures for full throttle operation. Fig. 3 shows the fuel consumption for different water outlet temperatures for propeller load operation, and Fig. 4 the water outlet temperatures compared with power output at 170 deg. Fahr. water outlet temperature on a percentage basis under operating conditions compared with the temperature range between the inlet and outlet cooling water.

In considering the results of these tests, it should be borne in mind that on the Liberty 12-cylinder engine the outlet water from the cylinder jackets is led through jackets on top of the inlet manifolds for the purpose of heating the mixture and improving vaporization. In these tests no attempt was made to separate these two functions of the cooling system, and the results, therefore, represent the effect of simultaneous changes in the temperatures of the cylinder and intake manifold jackets.

The effect of varying water outlet temperatures on power output appears to be less marked than might be

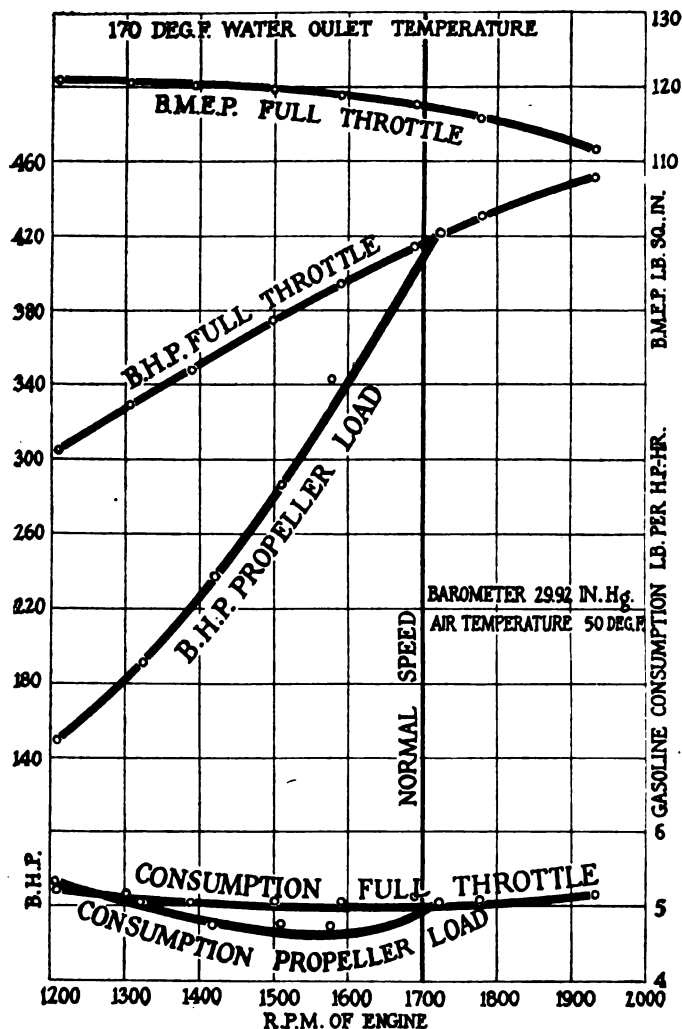
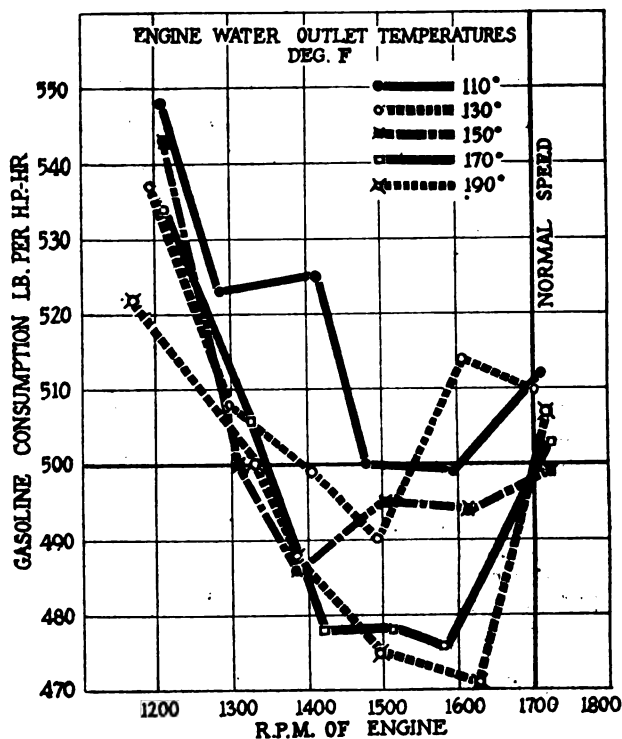
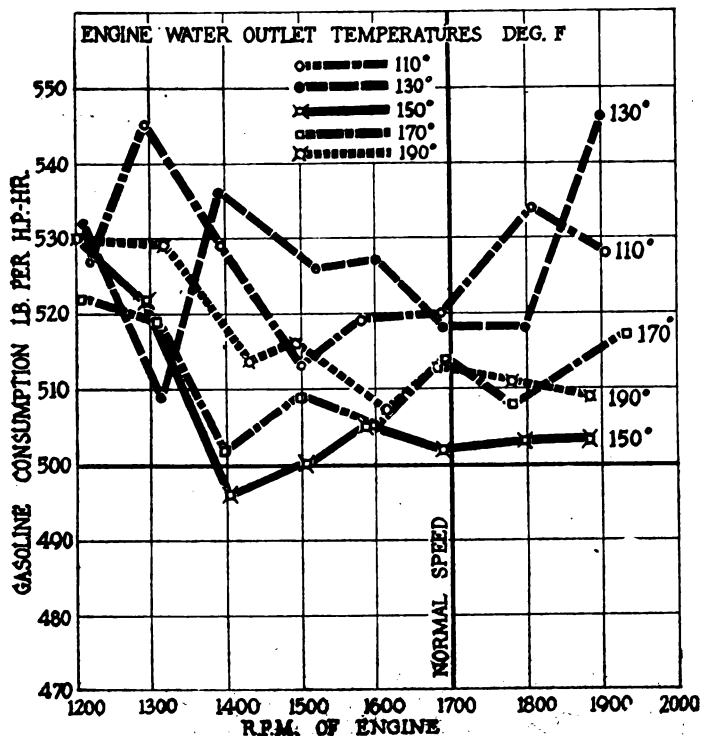


Fig. 1—Brake M. E. P. and brake horsepower corrected to sea level, and actual fuel consumption for full throttle and propeller load operation at 170 deg. Fahr. water outlet temperature

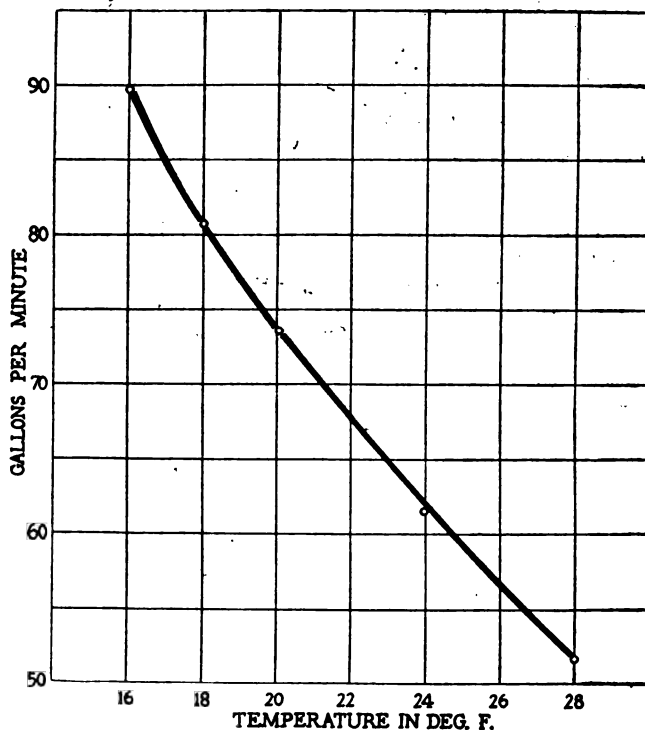
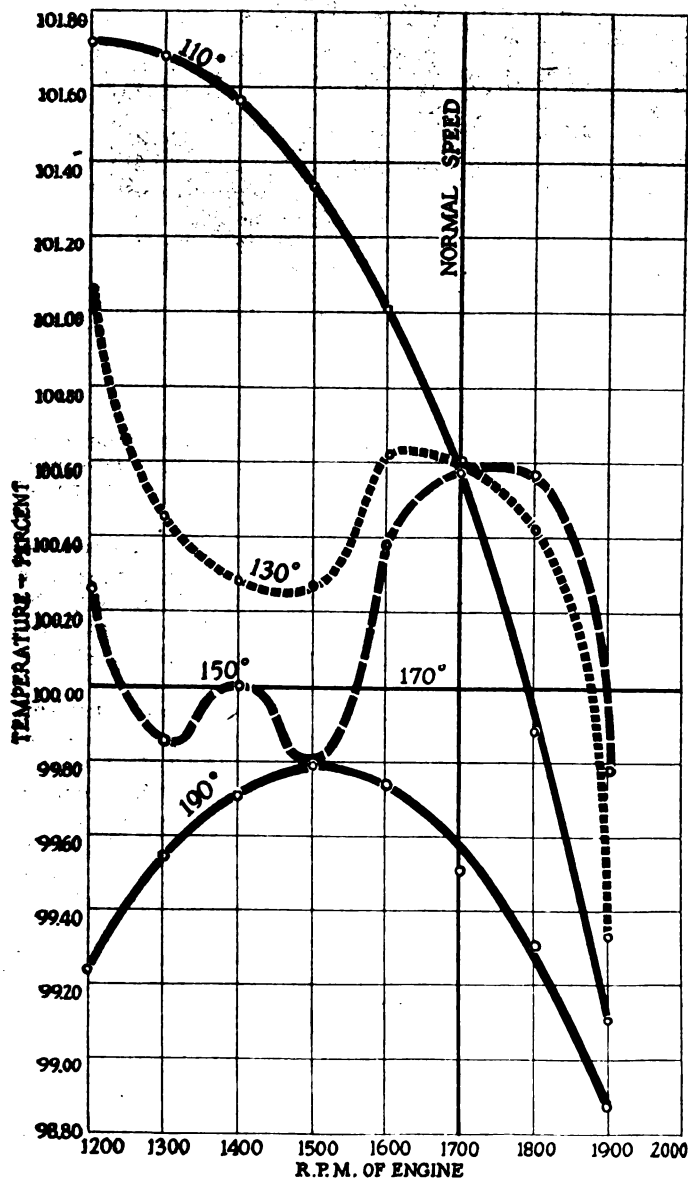


(To the left) Fig. 2—Fuel consumption at varying water outlet temperatures at full throttle operation, in pounds per brake horsepower-hour

(Above) Fig. 3—Fuel consumption with varying water outlet temperatures, for propeller load operation, in pounds per horsepower-hour

expected. The magnitudes by which the power outputs on this test differed with varying jacket temperatures were very small and to a great extent within the limits of

(Continued on page 1008)



(To the left) Fig. 4—Sea level power output of Liberty "twelve" engine with varying water outlet temperatures, compared with power output at 170 deg. Fahr. water outlet temperature on a percentage basis

(Above) Fig. 5—Temperature range of cooling water plotted against water flow through the Liberty 12-cylinder engine under operating conditions

Convertible Machine Is Both Tractor and Cultivator

With comparatively few changes, this motor cultivator was redesigned so it can be converted into a four-wheel tractor. The methods of conversion are as interesting as they are easy. It is suitable for all row crops.

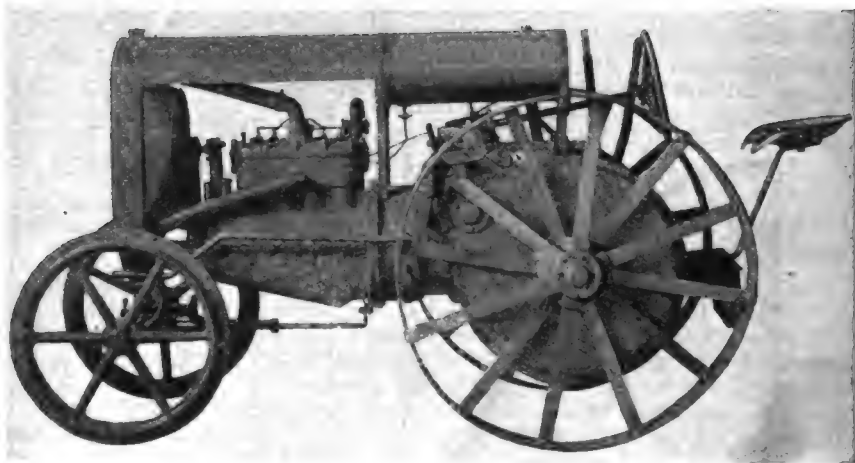
A CONVERTIBLE power machine that may be used for all work on the farm for which horses are ordinarily employed, has been developed by the Toro Motor Co. The machine was originally designed as a motor cultivator, and as such was exhibited at the 1919 Kansas City Tractor Show, but during the year it was found that by making a few comparatively simple changes it could be converted into a four-wheel tractor adapted for plowing and similar farm work.

The power equipment consists of a four cylinder Leroy $3\frac{1}{8} \times 4\frac{1}{2}$ in. engine which in the cultivator overhangs the axles on the driving wheels. A double band clutch of Toro design is fitted and the transmission is of the two speed forward and reverse type and equipped with ball and Hyatt roller bearings throughout. The power plant accessories include a Kingston carbureter, Eisemann high tension magneto, Automotive Parts fan, and B & W radiator. Gasoline is used as fuel and is carried in an oval section tank, located over the transmission housing. This has a capacity of 11 gal. One of the reasons for using gasoline as fuel is that it permits better throttle control of the engine, which is essential in plowing corn as, when the corn is low, the speed has to be reduced to about 1 m.p.h., whereas high corn can be cultivated as fast as 3 m.p.h.

The gear reductions are such that at 1200 r.p.m. of the engine the tractor moves at 2.5 m.p.h. on low gear and 3.6 m.p.h. on high.

The drive is through a differential and through universal joints located concentric with the steering pivot axis, to both wheels. The small rear wheel is of the castor

type and is locked in position when going straight ahead. This is accomplished by a spring latch which can be readily manipulated from the driver's seat. The two driving wheels each measure 42 in. in diameter by 6 in. width of rim and can be fitted with 3 in. extension rims. The small rear wheel is 26 in. in diameter by $4\frac{1}{2}$ in. width of rim. Without supplies, the cultivator weighs 2400 lbs.



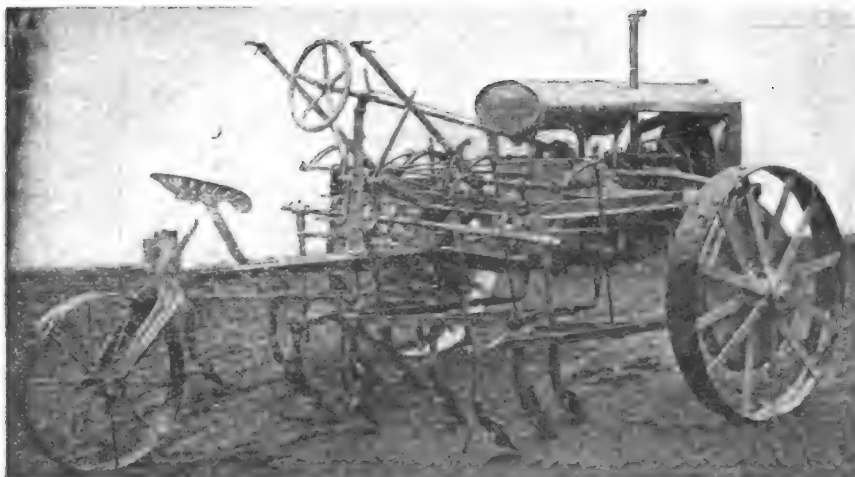
Toro two-plow tractor

The cultivator is made in three widths, suiting it to different row crops. The three widths—center to center of wheels—are 60, 74 and 88 in. The wheelbase is 98 in. in all models.

Eight kinds of cultivator equipment have been worked out, including cultivators for corn, cotton, beans and sugar beets. In addition to the tools furnished, the farmer can add a grain drill, a single disk harrow, a grass mower, binder and hay tools.

To convert the cultivator into a tractor, a certain number of extra parts are required, including the front truck, two side plates and a rear platform. The steering gear is semi-inclosed and is of the worm and sector type mounted on ball bearings and provided with means for adjustment. The tractor is of the frameless or backbone type and is unusually compact. It has a turning radius of 105 in. The weight of the tractor is approximately 2300 lbs.

As a cultivator, the machine can be used for cultivating corn, etc., for seeding, planting, pulling a harrow disk, binder, mower, manure spreader, hay loader, etc. As a tractor, the machine can be used for plowing as well as for doing belt work including feed grinding, corn shelling, etc.



Toro cultivator

An Analysis of Creeper Type Tractor Steering

Continuing his series of articles on tractors and tractor engineering, Mr. Norelius goes into a subject in which the existing literature is small. For that reason, if for no other, his careful consideration of the problem recommends itself to the designer and builder of such machines.

By E. F. Norelius

IN the development of automotive equipment requiring a differential action between the driving wheels, there have been invented a great many devices for balancing the load between the driving wheels and permitting relative motion between the wheels when making a turn or going over uneven ground. The different devices used may be divided under several headings and each separate device considered in relation to the rest of the machine.

The field is being searched continuously for new devices that will better accomplish the purposes. To stop the skidding of cars, to avoid differential action when it is not desired and to have it when it is desired, is the problem. However, this paper will consider only the standard types of differential and, more in detail, those devices requiring an absolute control of differential action because the vehicle is controlled by this means.

For this discussion, the various systems used will be divided as follows:

1. Standard or ordinary forms of differential.
 - (a) Bevel gear differential.
 - (b) Spur gear differential.
 - (c) Helical gear differential.
2. The foregoing forms with the use of brakes to assist in their action.
3. Separate control for either driver by means of clutches and brakes.
4. Separate control of speed for either driver by means of a positively controlled gear ratio to be used by the operator as desired.

Irrespective of whether automobiles, trucks, wheel tractors or track laying type of tractors are considered, it is understood that it requires some energy to overcome the turning resistance of the driving wheels on the ground. That is, no machine of the above types will roll as easily around a curve as it will straight ahead. The difference between the resistance encountered on a straight course and on a curve is by far greatest with the track laying type of vehicle.

The types included under the first heading are intended to balance the pull between the two driving wheels; any lack of balance is due to the slight amount of friction in the particular device, especially in the helical type of differential. However, assuming the drive to the two wheels to be balanced, then all resistance to turning must be taken care of by side thrust on the steering wheels.

In the second type, a brake is fitted on each side of the differential to decrease the speed or stop that side and increase or double the speed of the opposite side. This is accomplished in two different ways—first, by braking directly on the differential shaft, as in one model of Best

tracklayers, and, second, by braking one side of the differential through a planetary speed reducing gear, as on the Cletrac tractor.

In the first case, if one of the brake drums is stopped by a severe application of the brake, the driver on that side is stopped while the opposite driver is driven at twice its normal speed. In the second case, if the brake drum is stopped, the speed of the corresponding driver is reduced in a proportion depending upon the planetary gear ratio, while the speed of the opposite side is correspondingly increased.

There is a third system, which, however, cannot be classed as a differential, as it does not differentiate between the drivers, each driver being an independent unit with separate control by means of clutches. This type is exemplified in the Holt Caterpillar and some other makes of track-laying vehicles. These types also require a brake on each side to overcome the turning resistance of the drivers, especially those that are not equipped with front wheels.

The fourth type, as far as the writer knows, is not exemplified in any commercial vehicle of to-day. It consists of a positive drive to each driver but under control of the operator, so that the relative speeds of the two sides may be changed at will without disengaging and applying clutches. This type is particularly applicable to vehicles of the track-laying type without front steering wheels. A number of types along this line have been developed but have not been put into use.

The foregoing short discussion has been written to show more clearly the differences in application of different devices and to draw a line between what might be termed "self" differentiation and controlled differentiation. In the rest of this article, the turning of track-laying vehicles and controlled differentiation as exemplified under types 2, 3 and 4, are to be dealt with.

Fig. 1 represents a track-laying type of tractor and Fig. 2 that portion of the tracks of such a vehicle as comes in contact with the ground, together with the acting forces.

If a turn of any radius is attempted a resistance to a deviation from the straight course is met with which is dependent on the ground condition or coefficient of ground slippage of the tracks on the ground. In case of a right hand turn, this resistance may be represented by the small arrows. To determine the amount of this resistance, the method of uniform beam loading will be used. For any angular motion there is sliding motion in both the transverse and longitudinal directions. The transverse direction will be considered first.

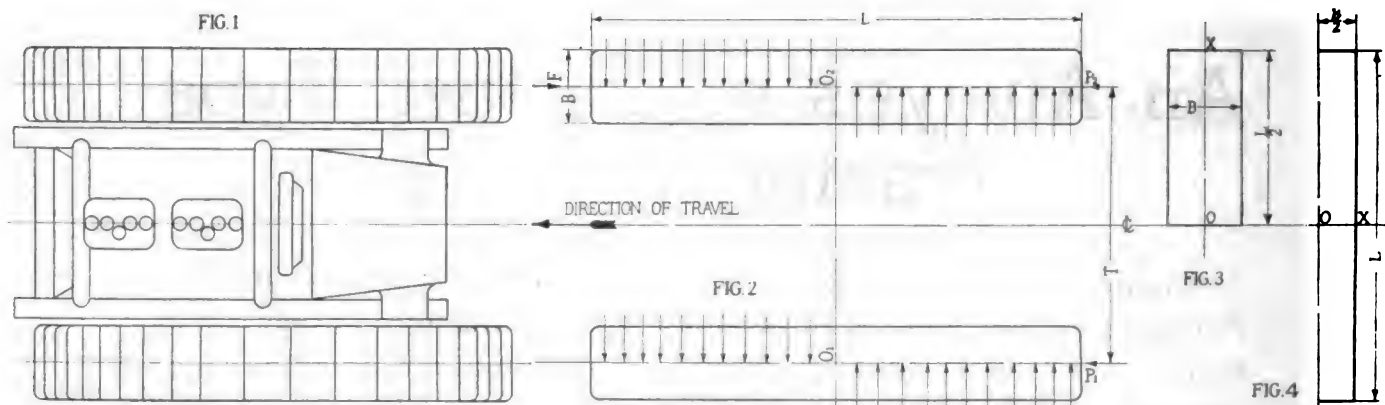


Fig. 3 represents one-half of the track on one side of the machine and that half which is at one side of the transverse center line of the machine.

Let U_1 represent the value of the transverse ground slippage or failure, in pounds per unit of area of track contact.

B , width of track.

L , length of track in contact with the ground.

For transverse motion the line XO may be considered uniformly loaded, the total loading being $U_1 BL/2$.

The moment of this loading on an arm of $L/4$ length is $U_1 BL^2/8$. Or, the total moment for both tracks is $(4 \times U_1 BL^2)/8 = U_1 BL^2/2$. Fig. 4 represents one-half of the track on one side of the machine and the portion which is at one side of the longitudinal centerline of that track.

By a like system of reasoning the total moment in a longitudinal direction equals $(U_1 B^2 L)/2$, where U_1 represents value of longitudinal slippage or failure, in pounds per unit of area of track contact.

Let M represent the total resisting moment to turning of both tracks. Then

$$M = \frac{U_1 BL^2}{2} + \frac{U_1 B^2 L}{2} \quad \dots \dots \dots (1)$$

Let f_1 represent the coefficient of ground adhesion of the tracks in a transverse direction and f the corresponding coefficient in a longitudinal direction.

Then

$$U_1 = \frac{f_1 W}{2 BL}$$

and

$$U_1 = \frac{f W}{2 BL},$$

where W represents the weight of the tractor.

The formula for the pull on the inside and the outside tracks can now be determined and, knowing values of U_1 and U_1 from tests, it is possible to determine the value of M which would correspond to the moment of the force exerted by the front wheel in the case of tractors equipped with front steering wheels.

Referring again to Fig. 2, the following designations will be used. Let F = rolling resistance of each track in pounds.

T = tread of machine or centerline distance of tracks, in inches.

P_1 = pull applied to outer track, in pounds.

P_2 = pull applied to inner track, in pounds.

M = resisting moment to turning, in inch-pounds.

Summing up the moments about O_1 ,

$$\Sigma M_1 = P_1 T + M - FT.$$

A right hand turn of the tractor is considered here, and the arrows in Fig. 2 are ground reactions in all cases.

Summing up moments about O_2 ,

$$\Sigma M_2 = M - P_2 T + FT$$

Each of these summations must equal zero in order that all forces may be in equilibrium—

$$P_1 T + M - FT = 0$$

Solving for the pull on the inner track,

$$P_2 = \frac{FT - M}{T} \quad \dots \dots \dots (2)$$

and

$$M - P_1 T + FT = 0;$$

or

$$P_1 = \frac{FT + M}{T} \quad \dots \dots \dots (3)$$

Check by solving for T and equating

$$\frac{M}{P_1 - F} = \frac{M}{F - P_2}$$

or

$$P_1 - F = F - P_2, \text{ and } P_1 + P_2 = 2F$$

which shows there is no motion forward or back, or that all forces are equalized.

If R represents the rolling resistance of the tractor in per cent, then

$$F = \frac{RW}{2},$$

W being the weight of the tractor.

From equation (1)

$$M = \frac{U_1 BL^2}{2} + \frac{U_1 B^2 L}{2}$$

By test it has been found that U_1 and U_1 are about the same under all conditions, and W , L and T are constant for any particular machine.

The only variables, therefore, are U_1 , U_1 , P_1 , P_2 and F . But since $U_1 = U_1$, we can plot curves between U_1 and P_1 with different values of F , also between U_1 and P_2 with different values of F . These curves are shown in Fig. 5 and it must be remembered that they show only track pull required for turning and do not include any drawbar pull. In case there is a drawbar pull P , the actual track pull becomes $P/2 + P_1$ on the outside track and $P/2 + P_2$ on the inside track. No brake will be required on the inside track, therefore, as soon as $P/2$ is greater than P_2 . In order to make clear the basis on which the accompanying curves are plotted, so as to include only variables, the equations for M , P_1 and P_2 will be transformed.

$$M = \frac{U_1 BL^2}{2} + \frac{U_1 B^2 L}{2}$$

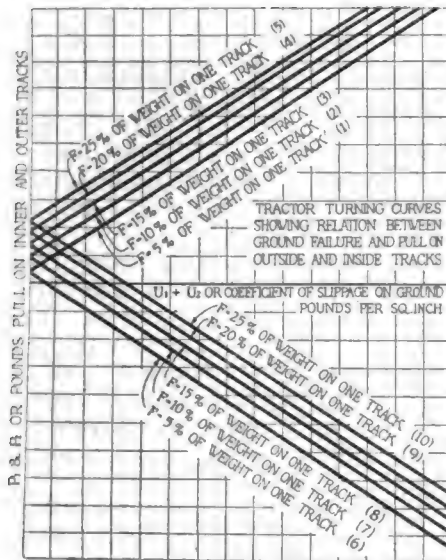


FIG. 5

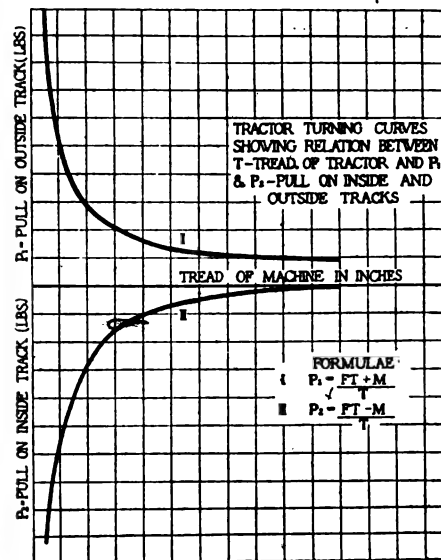


FIG. 6

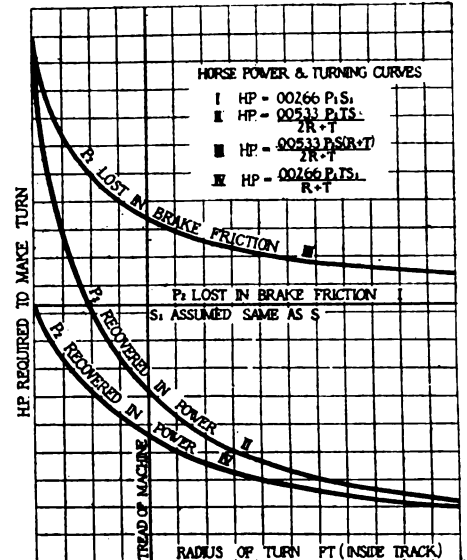


FIG. 7

But $U_1 = U_2$, therefore

$$M = U_1 \frac{(BL^2 + B^2L)}{2}$$

As $\frac{BL^2 + B^2L}{2}$ is constant for any one machine, let it be represented by K_1 .

Then

$$M = U_1 K_1$$

Also

$$P_1 = \frac{FT + M}{T}$$

And

$$P_2 = \frac{FT - M}{T}$$

Substituting the value of M —

$$P_1 = \frac{F + U_1 K_1}{T}$$

$$P_2 = \frac{F - U_1 K_1}{T}$$

But T is constant for any given machine, therefore let

$$K = \frac{K_1}{T}$$

$$\text{and } P_1 = F + U_1 K \quad \dots \dots \dots (4)$$

$$P_2 = F - U_1 K \quad \dots \dots \dots (5)$$

Work done in making any turn of θ deg. equals:

$$P_1 [2\pi (R + T) - 2\pi R] \frac{\theta}{360}$$

disregarding internal loss of energy, and where R is the radius of the turn measured on the inside track, because $P_1 + P_2 = 2F$ and

$$[2\pi (R + T) - 2\pi R] \frac{\theta}{360}$$

is the difference in distance forces P_1 and P_2 act.

Let E represent the work of turning in foot-pounds.

Then

$$E = \frac{2P_1 \pi T \theta}{360} = \frac{P_1 \pi T \theta}{180} \quad \dots \dots \dots (6)$$

The above is based on the condition that all power expended in negative pull P_2 can be recovered.

From these considerations we may conclude that the proper kind of a steering device is one which has control of the gear ratios between one track and the other, so as to force the machine to turn, and one which has a free mechanical or electrical drive from one side to the other so that the negative pull, P_2 , on the inside track will help the outside track.

In general it can be said that this condition holds when by rotating the drive wheel at one side of the machine, the drive wheel at the opposite side will be caused to rotate.

This energy may now be transformed into horsepower, but in so doing a certain type of machine must be considered. Type 2 will first be considered where a fixed speed is maintained at the center line of the machine and that part of type 2 where the brake wheel is locked and no loss is chargeable to brake slippage.

Let d be the distance traveled by the center line of the machine in making a turn of a radius R , measured on the inside track, in feet. Then

$$d = \frac{2\pi (R + 2) \theta}{360}$$

Let s = speed of machine at the center line, in miles per hour, t = time of turn, in minutes.

Then

$$t = \frac{\pi (R + 2) \theta}{180 \times 88s}$$

Or

$$H. P. = \frac{E}{t} \div 33,000 = \frac{\frac{P_1 \pi T \theta}{180}}{\frac{\pi (R + 2) \theta}{180 \times 88s}} = \frac{P_1 T s}{33,000 (R + 2)}$$

Reducing,

$$H. P. = \frac{0.00533 P_1 T s}{2R + T} \quad \dots \dots \dots (7)$$

Considering the type of machine where P_1 is not re-

covered but is wasted by means of a clutch and brake (Type 3),

$$H. P. = \frac{88 P_1 s_1}{33,000} = 0.00266 P_1 s_1 \dots\dots\dots (8)$$

Where S_1 is speed of outside track in miles per hour.

But in equation (2) s is speed of the center of the machine. Under this condition

$$S_1 = \frac{R + T}{R + \frac{T}{2}}$$

$$S = \frac{2s (R + T)}{2R + T}$$

Substituting in equation (3)

$$H. P. = \frac{0.00533 P_1 s (R + T)}{2R + T} \dots\dots\dots (9)$$

There is another system of steering which, although it has not yet been reduced to a practical basis, has marked possibilities. In this system the speed of the inside track is reduced and that of the outer track remains the same; this being accomplished not by disengaging a clutch and applying a brake but by providing a different gear ratio for the inside track than for the outside, which may be put into action at will. With this arrangement less horse power will be required for turning than with any of the other devices, as no power is consumed by a brake, and the outside track does not speed up. As in the previous case, the work of turning and the horsepower may be studied in its relation to other functions.

This type is referred to as Type 4.

$$E = \frac{P_1 \pi T \theta}{180} \quad (\text{equation 6})$$

Let d_1 = distance traveled by the outside track

$$d_1 = \frac{2\pi (R + T) \theta}{360} = \frac{\pi (R + T) \theta}{180}$$

$$t = \frac{d_1}{88s} = \frac{\pi (R + T) \theta}{180 \times 88s}$$

$$H. P. = \frac{E}{33000t} = \frac{\frac{P_1 \pi T \theta}{180}}{33000 \left(\frac{\pi (R + T) \theta}{180 \times 88s} \right)}$$

$$= \frac{88 P_1 T s_1}{33000 (R + T)} = \frac{0.00266 P_1 T s_1}{R + T} \dots\dots\dots (10)$$

Curves for equations (7), (8), (9) and (10) are plotted in Fig. 7 and show clearly the advantages of the different types of drive and their relations.

Assuming $R = 0$, then the above reduces to

$$H. P. = 0.0266 P_1 s_1$$

which is the same as the equation for the machine with clutch and brake, which is what would be expected.

With a machine equipped in this manner the speed of the center line of the machine is less than for the one equipped as assumed by equation (7). The relation between these speeds are the same as used in deriving equation (9)

$$s_1 = \frac{2s (R + T)}{2R + T}$$

Substituting

$$H. P. = 0.00266 P_1 T \left(\frac{2s (R + T)}{2R + T} \right) = \frac{0.00533 P_1 T s}{2R + T}$$

This is the same as equation (7), which is what would be expected, as in the derivations of these equations like considerations have been used, namely, no power loss and the same speed of center line of machine.

The question now arises as to how this energy consumed in turning a track-laying type of tractor affects the drawbar pull and what are the relations of these different functions. It can readily be seen that there is available at the track only a limited amount of pull dependent upon the value of $U_1 BL$. This available pull equals $U_1 BL$. If now $U_1 BL$ is less than P_1 then the machine will be unable to turn itself even when exerting no drawbar pull.

Further, assuming the drawbar to be applied at the center of the tractor, the available pull at that point

$$P = 2 (U_1 BL - P_1)$$

The pull on the inside track under this condition would be

$$P_1 = U_1 BL - P_1$$

But as P_1 is a negative quantity it can be seen that no actual pull will exist on the inside track until

$$P_1 = U_1 BL - P_1$$

or till $U_1 BL$ is equal to the sum of P_1 and P_1 , both being taken as positive quantities.

From the foregoing it can be seen that what is required is a drawbar so arranged that it can be shifted from the center of the machine toward the inside track when it is desired to make a turn. It is a question how this can be done, but the reasoning shows the fallacy of fastening the drawbar rigidly at the back of the frame and that pivoting it approximately at the center of the machine is of great advantage.

Effects of Water Outlet Temperature on Engine Output

(Continued from page 1003)

experimental error. In theory, a lower jacket temperature should increase the density of the charge with consequent increase in power. This action, however, is minimized by the short-time interval through which jacket heat can act on the incoming gas. Similarly, the loss in charge density with higher jacket temperatures is offset largely by the improved vaporization due to the higher intake manifold temperatures.

Reference to the curves of percentage differences in power output against speed, Fig. 4, bears this out. It would seem that a critical point exists at 1700 r.p.m., below which the effect on density is most noticeable, and above which point the effect on vaporization is the dominant factor. The tendency for power output to increase with decreasing water temperatures below 1700 r.p.m. can be definitely identified. On the other hand, there is a contrary tendency for specific fuel consumption to decrease with increased jacket temperatures.

A general balance between the opposing factors seems to exist at a water jacket temperature of 170 deg. Fahr. under these conditions. The fuel consumption and power output are as good as any obtained at other water temperatures, allowing for limits of experimental error.

As regards temperature range between inlet and outlet water, the curve in Fig. 5 reveals it to be practically proportional to the water flow; that is, the quantity of heat rejected to the jackets is nearly constant irrespective of the flow. A water flow of 75 to 80 gal. per min. creates a temperature range of 18 to 20 deg. Fahr.

New French Kerosene Engine Has Single Sleeve Valves

In the Caffort kerosene engine, a single sleeve is driven by an eccentric off a half time shaft in the base chamber. Before intake, a partial vacuum is formed with all valves closed, and then the fuel is injected in a pulverized condition by means of a special pump.

By W. F. Bradley

IN June, 1918, the Automobile Club of France organized a competition for automobiles running exclusively on kerosene. The first and the second prizes were won by Unic cars having engines modified to the Bellem and Bregeras system. These were the only cars which went right through the trials and fulfilled all requirements.

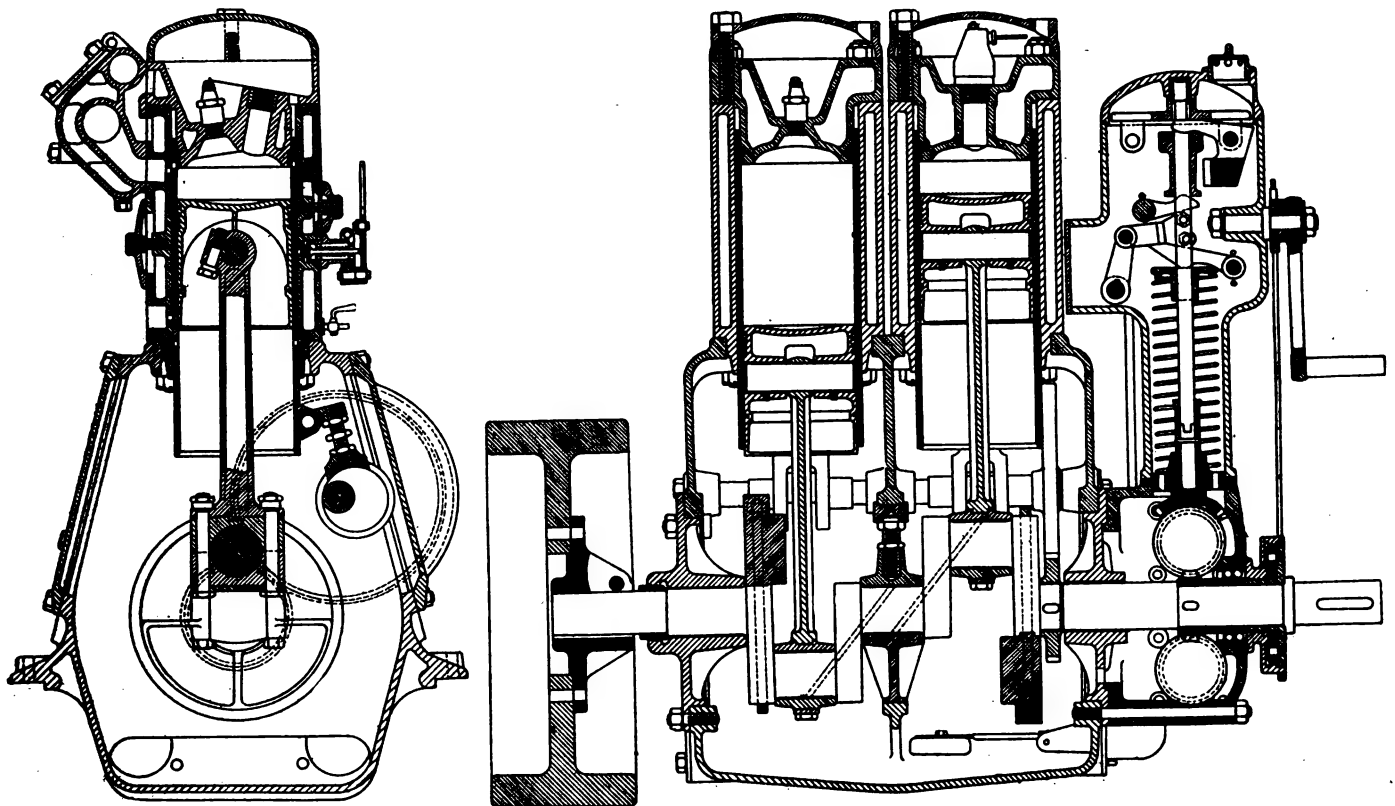
These engines were of quite normal construction and originally had been similar in every respect to other Unic power plants but had been modified by fitting a special camshaft and adding the pump and pulverizer necessary for the Bellem and Bregeras system of using kerosene. It is obvious that better results could have been obtained if the engine had been specially designed for using kerosene according to the Bellem and Bregeras system, and now engines on these lines have been built by the Caffort company of Paris.

The Caffort engines are all stationary types. They are built with one, two or four cylinders, and have a bore and stroke of 4.3 x 6.2 in. These engines have a

single sleeve driven by an eccentric off a half time shaft in the base chamber. The sleeve makes two strokes to four strokes of the piston. The cycle is not the same as on the standard gasoline engine. On the first, or intake stroke, the piston moves down while all ports are closed, and a partial vacuum is formed in the cylinder. About 45 deg. before lower dead center, fuel is injected into the cylinder, by means of a special pump and a small automatic valve in the cylinder head. This injection of fuel into a partial vacuum causes very fine pulverization and makes it possible to start up on kerosene from cold. Pure air is admitted during the rest of the intake stroke, and the mixture is compressed, fired, and exhausted in the ordinary way.

With this cycle the single sleeve is considered more advantageous than poppet valves. Gasoline is fed into the cylinders, when the partial vacuum has been formed, by means of a variable stroke piston pump.

The horsepower obtained from the 4-cylinder engine is 23 at 600, 25 at 700, and 30 at 800 r.p.m.



Sections through the Caffort single sleeve kerosene engine

Production Processes for the Straight Run Automotive Foundry

As the supply of gray iron castings has been called the barometer of the industry, production efforts of to-day may be realized or defeated in the foundry department. This article was written with that thought in mind and it is, consequently, deserving of study and consideration.

By J. Edward Schipper

IT has been said with more or less truth that the supply of gray iron castings is the barometer of the automotive industry. This statement becomes more apparently true than ever when it is remembered that, of the labor disturbances in the industry during the past year, the most persistent have been in the foundries. This is no doubt due to the fact that a great many foundries are constructed and operated in such a manner as to make conditions very unpleasant for the men who work in them.

More manual labor and more disadvantageous conditions as regards health have existed in foundries than in practically any other phase of automotive manufacture, and it is only recently that conditions have begun to substantially improve. Here and there manufacturers have realized the fact that it would be difficult to hold men in the foundries unless conditions in foundry work were brought up to the level of other phases of manufacture. This is more true now, when there is a demand for good men in all branches of industry, than it was a few years ago when an actual unemployment situation existed.

At present there is a movement in the foundry fields to change conditions, so the men may work in pure air and have the advantages of mechanical contrivances to eliminate the heavy lifting and other manual work which was once considered necessary in this field.

The foundry of the Ford Motor Car Co. has been used as a model by several companies. One reason is that efforts have been made to introduce mechanical aids wherever possible and to remove the unpleasant atmospheric conditions which would exist if precautions were not taken.

The results of this care have been that the labor turnover in the foundry is lower than in some of the other Ford departments, in spite of the situation as it exists elsewhere, where the foundry turnover is higher than any other department. It simply comes back to the situation that foundry work can be made as pleasant as other manufacturing work, provided that the proper mechanical aids are introduced and the proper installations are made to remove the gases incidental to making castings.

In the Ford foundry department, which is a separate section of the manufacturing institution, approximately 900 tons of castings are made daily. There are 6000 men employed in all departments, including drafting, etc., of which about 4500 are production men engaged in the manufacture of castings, both straight production and job work. There are about 1500 pattern makers, draftsmen, millwrights, etc. This also includes the brass foundry, in which, however, little work is done.

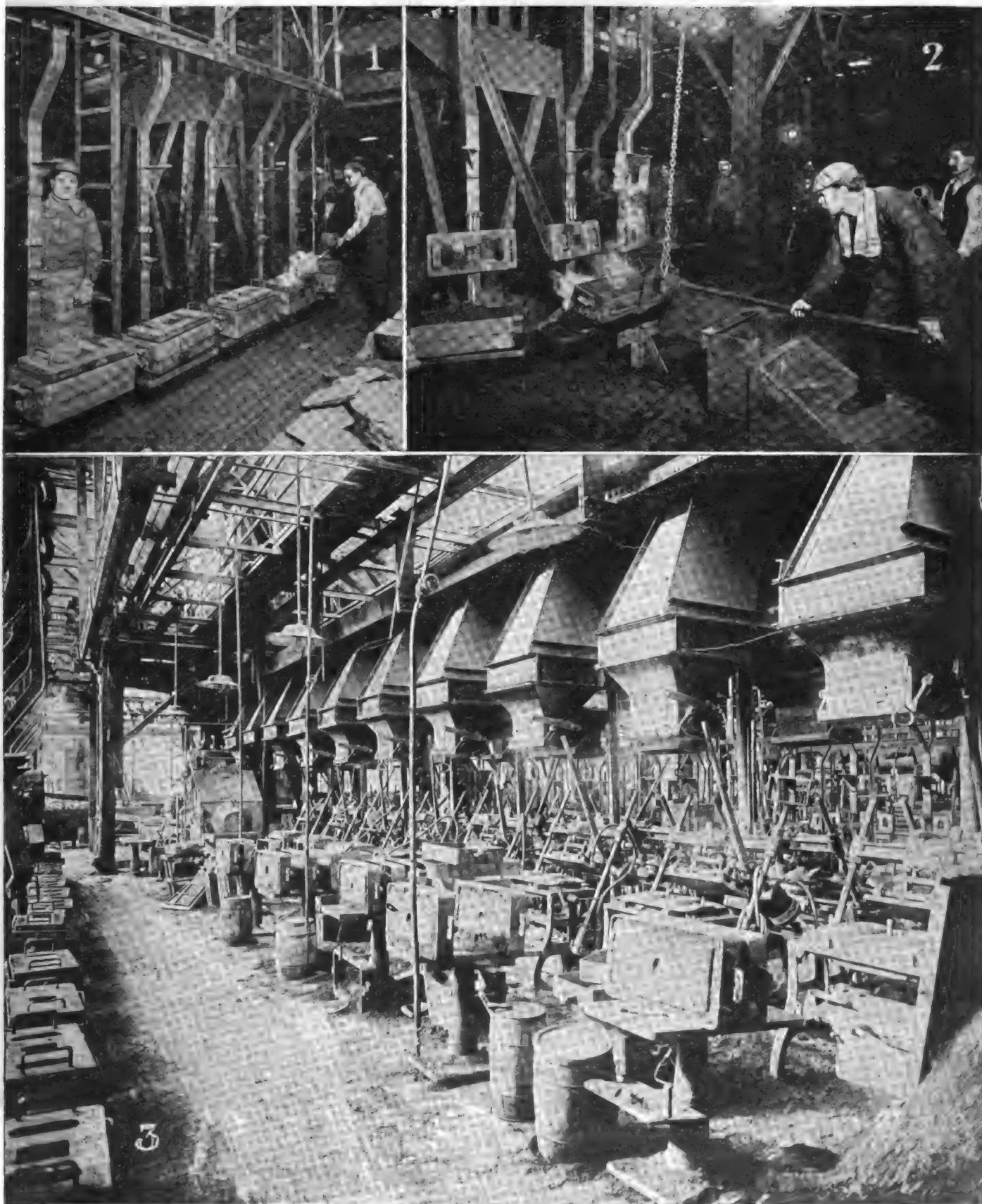
In arranging the Ford foundry, the layout was designed

to provide the best possible working conditions and to make the greatest use of production methods for establishing a continuity of progress. The same continuous motion of parts from the raw state to the finished condition, which exists in the chain conveyor assembly system and in the chain manufacturing system is also found in the foundry. Here the castings are in motion even during their production, which is quite contrary to the usual practice of having the ladles of molten metal brought to the molds and having the molds around the floor in various states of disorder. A mechanical lifter and transporting apparatus, which in some cases is manual only to the extent of guidance, all of the weight being held by overhead apparatus, not only makes the work easier and more pleasant for the men but also increases the productive ability of the foundry.

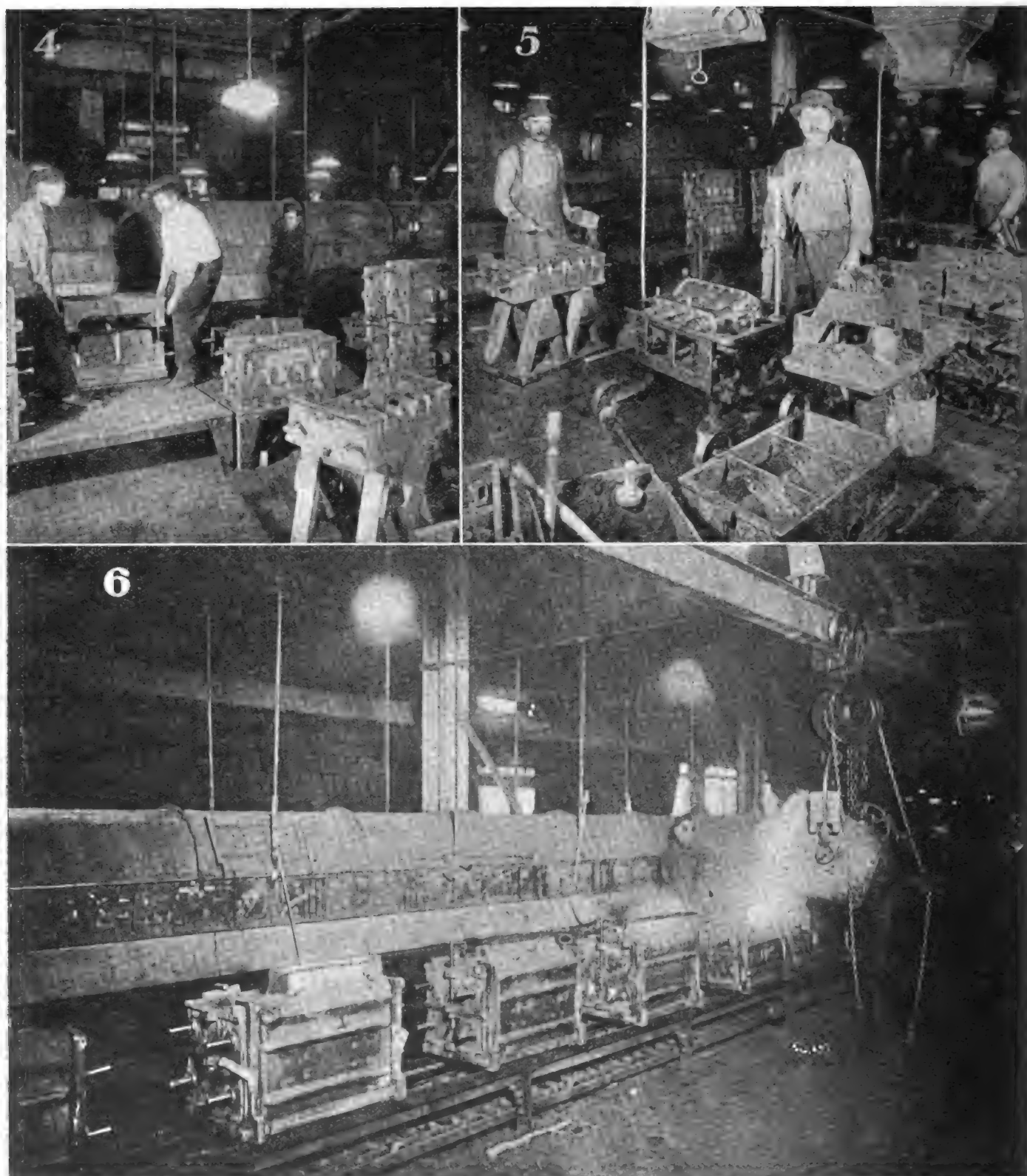
The mechanical handling of the foundry work starts with the sand. This is delivered automatically by overhead conveyors to hoppers, so that sand can be secured by the molders by simply pulling a lever without bending their backs. The mold is delivered from the molding machine operator to a small table directly behind him, in the casting of the cylinder heads, for example, to a small table at which the cores are set in. Then they are lifted to the conveyor, where a man with the other half or cope side closes the flask, puts a weight on it, and sends it on its way along the conveyor.

The metal is poured as soon as the flask is closed. The closed flask reaches the ladle man without manual transportation, as it is carried along a conveyor which moves on an overhead elliptical track. The speed of this conveyor is from 6 to 15 ft. per min., depending upon the sizes of the castings to be made and the desired production. After having been poured, the casting travels to the opposite side of the ellipse where the cope is removed and, a little further along in its progress, an overhead supported fork picks up the flask, removes the casting and drops it on a grid or grating upon which there is a heavy down draft of air.

The sand goes down to the floor below. From there it is elevated mechanically, screened, and then conveyed back to the original hoppers, to be used again by the men at the molding machines. There are nine of these conveyor systems in operation for casting work, practically all of the production castings being handled by these elliptic tracks. They are sufficiently long to carry a supply of flasks to the ladles and travel to a sufficient distance for cooling. Finally they are removed, shaken out and the empty flasks are sent back to the molding machine operator.



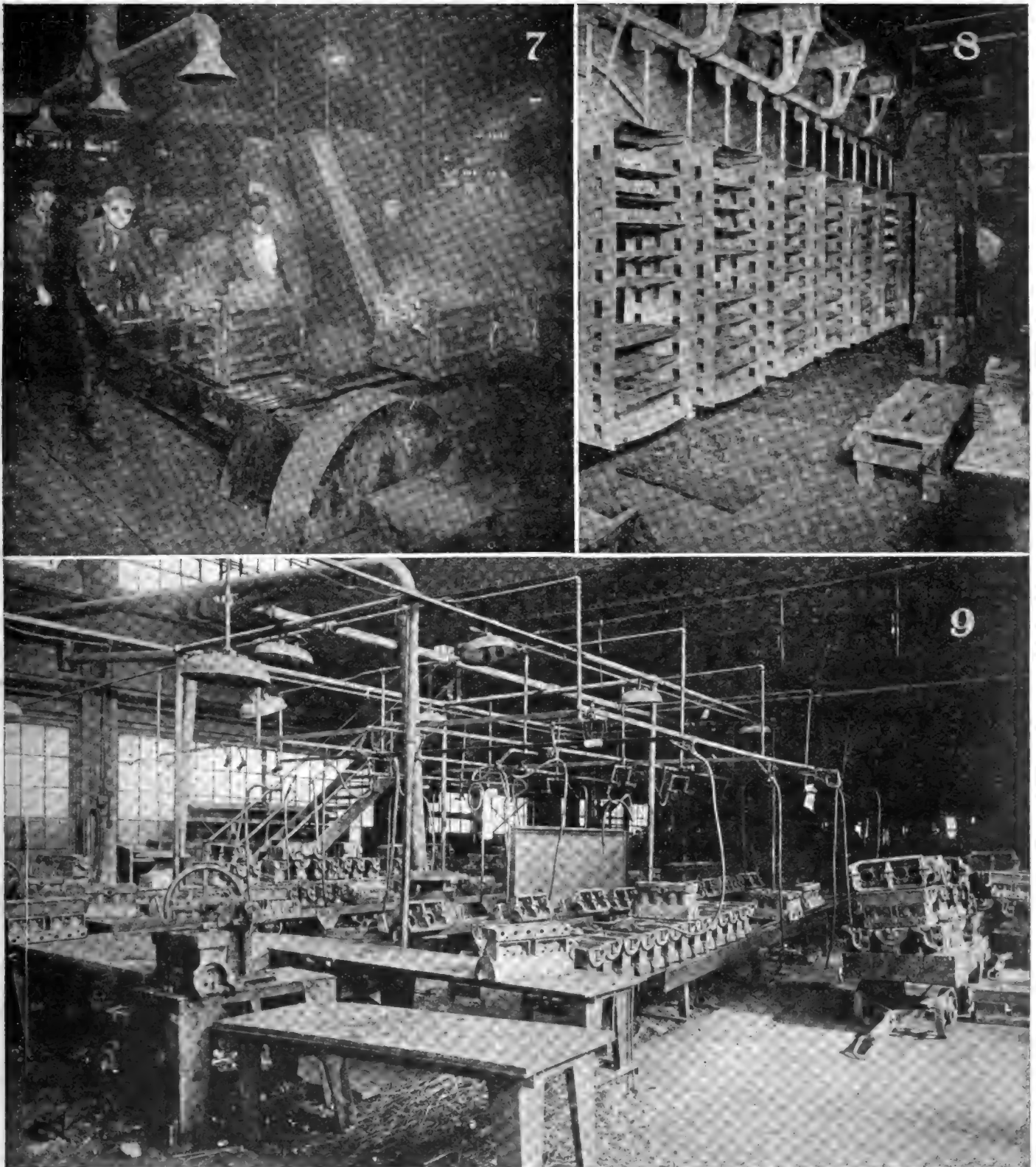
1—Conveyor in operation with flask closed and metal being poured. 2—Removing the mold after the casting has been made, with an overhead suspended fork. Shake-out grating is shown in the foreground. Sand passes through this to the floor below. 3—Row of molding machines showing the overhead hopper, the small tables upon which the flasks are placed ready for the cope section to be put on, and to be placed upon the conveyor



4—Cylinder block operation showing the core setting and closing before placing upon the chain conveyor. 5—Molding machines for the cylinder blocks. Note the overhead hoppers for sand and the levers which are pulled to feed it. 6—Cylinder block molds passing along conveyor and metal being poured from worm gear ladles

A special system is used for cylinder block manufacture. It is a chain conveyor system along the same idea as the overhead conveyor for the other castings but, as the cylinder blocks are heavier and more complicated and consequently smoke considerably after the gases are burnt from the sand, they pass under a long exhaust hood before being dropped on the shake-out grates.

This care with the smoke, which comes from the cylinder block castings, makes the air in the Ford foundry far purer than that found in the average shop. There are oils in the sand which release gases, due to the heat of the molten metal poured into the molds. These immediately ignite and while they are burning, are consumed to CO_2 , which is, of course, an odorless, colorless gas, and,



7—Transferring the molds after the metal has been poured to the center conveyor which passes beneath the hood to draw off the gases which are emitted from the casting after the flame has gone out. 8—Continuous core oven. Note the rack on overhead carriers and the oven in the background into which the carriers pass. They are of such dimensions as to seal the oven, although entering it. Note how the roller conveyor enters through a slot in the brick at the top of the oven. 9—Cleaning room in the cylinder casting department to which the castings are taken after they have left the smoke house where they have cooled

while not a supporter of life, is not by any means troublesome as long as it does not dilute the air to any great extent.

On the other hand, as soon as the flame goes out, un-

pleasant smoke and gases emanate from the casting. They must be taken care of or the air in the foundry becomes so thick that the place is objectionable for many men to work. This smoke is taken care of by long hoods com-

pletely covering the castings for a long section of travel along the chain conveyor. By the time they come out of the conveyor to the shake-out grates the castings are practically smoked out and, as soon as the sand has been shaken free, the castings are run into a smoke house with four large stacks creating an upward draft sufficient to carry away the heated gases.

Another phase of foundry work which, in the case of the Ford factory, has been solved in a manner which keeps the air practically free from offensive gas, is in the use of a continuous core oven. The racks containing the cores pass into a slot in the oven and not only form carriers for the cores but also are of such a size as practically to seal the oven. The elliptical layout is again used here, the oven having two doors, an entering and a leaving door, with the racks carried on an overhead track and suspended upon rods swung from the rollers passing along the tracks.

When the cores are removed from the racks, after they have left the oven, they are put on a flat belt. This carries them to the core stockroom where they are removed and put in the classified storage racks.

This mechanical means of transporting cores and of sealing the oven, in addition to keeping the work continuous, has solved one of the largest difficulties usually encountered in foundry work. That is, it keeps a real

continuous production and at the same time has a continuous oven arrangement sealed at all times.

During the summer, foundry conditions generally are such that the men drink a great amount of water. It has been found that ice water placed within reach of the foundry workers is a big temptation. The men, being warm and overheated, will consume large quantities of the ice water, generally resulting in upset stomachs and putting them in bad physical condition. All of the drinking water at the Ford foundry is held at a definite temperature, which has been found to be pleasant, but not injurious.

The mechanical methods do not require large space. In fact, for an example, the cylinder block castings, of which about 125 tons are being turned out daily, take up less space than 25 tons in the usual jobbing foundry. There is a portion of the foundry set aside for art work, which closely parallels the usual job foundry. The space required for this is much larger than that for the cylinder production department. This, of course, indicates that, where straight production work is turned out, the foundry can be designed mechanically to take care of it, and results not only in a place far more pleasant for the workmen but also in the highest possible efficiency of the foundry from a straight output consideration.

Unusual Spring Features Mark Truck Line

TWO features of particular engineering interest are incorporated in the trucks now in production by the Service Motor Truck Co. These include a new oiling system for the spring shackles and a method of maintaining the alignment of the rear wheels while using Hotchkiss drive.

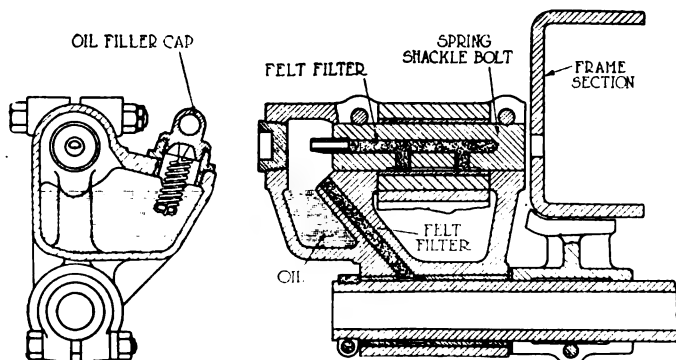
The method of spring bolt lubrication as applied to the 1½ ton model is illustrated herewith. A reservoir is cast into the spring shackle or bracket as a container for the lubricant, and holds oil sufficient for a month of ordinary usage. Oil finds its way from the reservoir to the spring bolts through a system of holes drilled in the spring shackles and bolts. These holes are sufficiently large to avoid the possibility of clogging and are filled with felt packing, to resist and regulate the flow of oil.

The spring bolts use oil only when the truck is in motion. To prevent surplus oil being delivered to the bolts when the truck is idle, the oil holes do not open directly into the lubricant in the reservoir, but come out at a point above the oil level. The holes, therefore, depend upon their supply from the splashing of the lubricant while

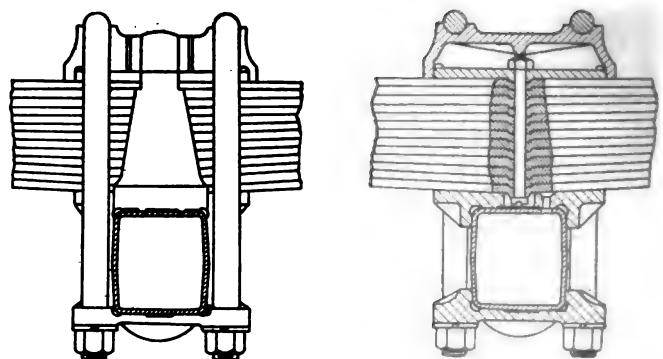
the truck is in motion. The oil feed is also restricted by the felt packing to a flow just sufficient for the needs of the spring bolts. The reservoirs are filled through openings covered by caps that are held securely to their seats by springs. The reservoirs can be conveniently filled at the same time the engine crankcase is being given attention.

To prevent misalignment of the spring leaves, they are made cup shape at the center bolt so that when the spring is assembled all the leaves are fitted into one another, making it impossible for one leaf to slip over the other. A plate on the top leaf is dove-tailed into the spring and held in perfect alignment with the spring seat on the axle by the spring clip pad, which in turn is tied to the spring seat by risers straddling the spring at each side and registering in slots provided in the clip pads.

THE Post Office Department has announced the opening of a parcel post service with Lithuania. Parcels up to a weight of 22 lb. will be accepted at the rate of 12 cents per lb.



Diagrammatic illustration of the method of lubricating the spring bolts on the 1½-ton Service truck



Method of tying springs to axle in combination with Hotchkiss drive on Service truck

Reducing the Labor Turnover by Developing the Individual

Monotony work and blind-alley occupations have been recognized as a potent cause of labor turnover. This article outlines a plan which is being successfully developed by a machine tool concern to get rid of the two difficulties. Parts may be adopted, with modifications, in almost any plant.

By Norman G. Shidle

WHEN a man performs the same labor operation over and over again, day in and day out, it is almost impossible for him to retain interest in his work. Such work tends to do one of the two things. Either it kills ambition and enthusiasm or it makes the man discontented. In the former case his work suffers, in the latter he leaves the plant, rather aimlessly hoping for better things elsewhere. Employment managers know that it is difficult to learn the real cause for which a man is leaving. This difficulty often arises because the man himself has no clear idea of the reason. His work has simply become monotonous, he sees no chance of learning anything more and so he just "moves on."

On the other hand, modern industry has developed in such a way that the production manager has found so-called monotony work a practical necessity in many cases. It has not seemed possible to avoid this type of job and at the same time to obtain satisfactory production. Industrial practice has seemed to indicate that production goes up in proportion as the various units of work are specialized and as men are thoroughly trained in those specialized operations. Thus, even though monotony work has been recognized as a cause of labor turnover, production necessities have hindered its elimination.

One successful machine tool plant, however, has found it possible to eliminate to a large extent monotony work and blind-alley occupations. The plan is not a theoretical one but rather it is a development of years of practice combined with details secured from various sources and adapted to the needs of this particular plant.

Personal Development and Production

The basic idea, from which the present rather definite plan has been evolved, is that a working force of intelligent, thinking, enthusiastic men will produce a better article in greater quantity than a force of highly specialized machine-like men and that such men can be developed only by giving them an opportunity to learn as much and as rapidly as their ambition dictates. It is this idea, not primarily a desire to reduce turnover, that has motivated the management of the Fellows Gear Shaper Co. in the development of its plan, which obviously gives the workmen opportunity for personal development and advantage, but which also is believed to benefit the company in the long run; that is, the company is not in any sense "giving" the workman anything.

The following practice, in use at this plant for many years, was the genesis of the "promotion system" which has now been worked out in detail. The foremen and

superintendent kept a personal and interested watch on the work of the men under them. When a man appeared proficient on the machine he was operating, it was suggested that he go on another machine at the same wages. At the same time, he would be given the option of continuing at his present work with a slight increase in pay. The theory was that, if a man had ambition and enough desire to get ahead to invest something in himself, he would take the opportunity to learn more. Such a man could finally develop into a toolmaker or foreman and thus gain more ultimate benefit than by accepting the slight increase in pay without any corresponding increase in opportunity. Moreover, men who requested such an opportunity were permitted to go on other machines and to learn the various phases of machine tool work. Thus, every workman knew that he could have an opportunity to learn and finally to advance.

The Promotion System

As an outgrowth of this practice, the promotion system was inaugurated several months ago. Since it provides at present only for those men who are almost entirely green to start with, it includes only a small percentage of the 700 men who comprise the plant working force. The promotion system is being developed, however, so that a man may step into it at any point, being given credit for whatever previous experience he may have had. When this development is fully worked out, it is expected that a great majority of the men will be participating. For this reason, the plan is of interest and importance as an example of a successful attempt to modify and to some extent to eliminate the difficulties of monotonous work and blind-alley jobs.

The promotion system works as follows: When a man is hired by the employment department, the plan is explained to him and he is given the opportunity to participate if he wishes to do so. No pressure is brought to bear, however, as the proper working of the system is largely dependent upon its including only men who have the ambition and desire to carry through the course.

The length of time necessary to complete the course varies with the ability of the man; he must know one job thoroughly before he is passed to the next grade. The average time for completing the course is about four years, although one man has finished it in 18 months.

The plant is divided into seven sections, according to the difficulty and skill involved in the various opera-

tions. Following are the sections and the work included in each:

Section 1	Section 4
Cleaning Castings	Final Assembly
Trucking	Engine Lathe
Sweeping	Section 5
Section 2	Grinders
Bench Assembly	Inspection
Drilling Machines	Section 6
Section 3	Gear Shaper Department
Milling Machines	Section 7
Turret Lathe	

The men are advanced from one grade to the next on the basis of tests, together with the opinion of the foreman of the department in which they are working. The tests are prepared by the employment department and are given out each week; they are divided into two parts of ten questions each. One part relates to shop problems and practice, the other to arithmetic. The man must learn and write out the answers to these questions each week. He may find them from any source he wishes—his foreman, books, his personal experience or elsewhere. The foremen never have more than twenty men under them, so that they are able as well as willing to answer any questions the men may ask.

Each lesson is preceded by a short foreword to the operator. This foreword enables the company to present to the operator some of the ideals of the firm and the opportunities which are open to him. The first lesson in the course is given as an example.

Lesson 1 FOREWORD

The object in preparing these papers is to place before the inexperienced man entering the factory with the desire to learn what he can about the machine tool trade such questions as can be best given them in this manner. It is our intention to prepare one each week as you progress with your work. The question arising in your daily work will suggest the subjects for these sheets. The practical side will be taken up and as much of the theoretical as is necessary to perform general machine work.

These are not instruction papers, they are question papers. Go to your foreman when you are not quite sure. He is your instructor. You will find plenty willing to help you, but you must first be willing to help yourself. There are positions open to men who are qualified to fill them. The faster you progress the better we shall be pleased, but bear in mind that you are not big enough for a bigger job until you are too big for the one you already have. If your opinion concerning yourself does not agree with the opinion held by your foreman, try to judge yourself honestly. It might be that he is right and you are wrong.

The foremen throughout the shop we know to be as good as the best. They understand the work in their departments, and you will find them courteous, fair-minded, obliging men to whom you may go in time of trouble and receive a civil and reasonable answer to your inquiries. It is the wish of the family to have each new member enter with a spirit of good fellowship, and to be always ready and willing to help a fellow worker. If it happens that you have a grievance, do not sulk until you fancy that every man in the shop is using you wrong. Go to your foreman; confide in him. Remember he is your big brother and will help you.

In answering the questions, place the answers on the paper, numbering them to correspond with the numbers on the question sheet. Pass in to the employment office one week after you receive them.

The following things you should find out this week:

SERVICE TRAINING COURSE QUESTION PAPER No. 1

1. Name, according to shape, the three hammers machinists use.

2. What kind of steel are machinists' hammers made from?
3. Name the form and material of the hammer used to strike heavy blows where the steel hammer would bruise or mar a finished surface.
4. Describe the center punch and state some of its uses.
5. Describe the scratch awl and state some of its uses.
6. Describe the flat cold chisel and state some of its uses.
7. Describe the cape chisel and state some of its uses.
8. Describe the diamond point chisel and state some of its uses.
9. Describe the round nose chisel and state some of its uses.
10. What is considered the best angle to grind a flat cold chisel for cutting cast iron?

ARITHMETIC QUESTION PAPER No. 1

1. What is the difference between notation and enumeration?
2. What are the four fundamental processes of arithmetic and why are they called fundamental?
3. Write in figures: (a) five hundred, four; (b) eighty-one thousand, four hundred, two; (c) five million, four thousand, seven; (d) one hundred eight million, ten thousand, one; (e) thirty thousand, ten.
4. Write each of the following numbers in words: (a) 980; (b) 605; (c) 28,284; (d) 9,006,042; (e) 850,317,002.
5. 104 plus 203 plus 613 plus 214 equals what?
6. 6,354 plus 2,145 plus 2,042 plus 1,111 plus 3,333 equals what?
7. If a mine produced 7,018 tons in the first week of January, 7,236 tons in the second week, 6,848 tons in the third week and 2,543 tons in the fourth week, how many tons were produced in the entire month?
8. A week's record of coal burned in an engine room is as follows: Monday, 1,800 lb.; Tuesday, 1,655 lb.; Wednesday, 1,725 lb.; Thursday, 1,690 lb.; Friday, 1,648 lb.; Saturday, 1,020 lb. How much coal was burned during the week?
9. The total cost for erecting a steam plant was \$2,675. The engine cost \$900; the boiler, \$775; the fittings and connections, \$225. The remainder was expended in erecting the engine house. How much was the cost of the engine house?
10. The total weight of a car loaded with coal is 4,326 pounds and the empty car weighs 1,564 pounds. What is the weight of the coal?

The papers are turned in to the employment department and are graded. Sixty per cent is a passing grade for the arithmetic problems, while the shop problems are marked on an A, B, C, basis, C being the lowest passing grade. The papers are then returned to the men with the mistakes and corrections noted.

When a man has been graduated from the sixth section, previously mentioned, he is a skilled machinist and is capable, not only of doing excellent work in the tool room, but if he has the necessary executive ability, is capable of filling a foreman's job or any other position of a similar nature. First class toolmakers are difficult to procure. The success of this system in developing such skilled men is witnessed by the fact that only seven toolmakers have been hired from the outside during the last four years, and in this time the working force has increased over 300 per cent. Three of these are still at the Fellows plant, while the remainder of the forty-two toolroom men have been developed within the plant. This presents an exceptional record for toolroom turnover.

Foremen co-operation is necessary if a system of this kind is to succeed. While no definite reason can be stated for the hearty assistance which has been obtained at the Fellows plant, a logical surmise may be made. Practically every foreman in the plant has been promoted from the ranks of the workmen; he is a product of the methods and development of the plant. His

questions were answered when he was green, and others helped him to gain experience. Consequently he is ready to help others who ask him for assistance.

Does the plan work? From the standpoint of the workman, there can be little question. The men are, of course, paid the regular rates for the particular job on which they are working while they are gaining this experience. Thus they gain experience that makes them worth more money and earn a good living while doing it. But, from the company standpoint, as well, the plan is successful. While it is conducted largely for the benefit of the men, it results in the obtainment of the best possible quality and quantity production. The labor turnover figures render the decision. The monthly turnover at the Fellows plant averages about $3\frac{1}{2}$ per cent while 7 per cent is the highest turnover in any month for many years.

The plan not only reduces labor turnover, but definitely affects general contentedness among the employees—although, it must be emphasized again, it was not devised or put into effect for that purpose. Its relation to unrest is best illustrated in a story told recently by the plant superintendent. It may be paraphrased as follows:

"Not long ago a middle-aged man came to work in our plant. He was a drill-press operator and had been working on that machine for twenty years. I knew that he was considered to be of the discontented type of workman who believes that the world is all wrong and that he has not had a chance. After he had been working here for a while I went over and began to talk to him. I talked as a friend, used his own type of speech and talked of the things in which he was interested.

"Soon he unburdened himself of his woes. He said he had never had a chance. He had been working on the same kind of machine for twenty years and he wasn't any further along than when he started, etc. So I said to him,

'How about your switching from this job and learning to run a couple of other machines. Then I'll give you a turn in the tool room. You can make good money there and you will have learned a great deal besides.'

"No," he replied, 'I tried that once, but I didn't like it. You have to work from blueprints, and do different things all the time. I like a job where I can come in and do the same thing every day.'

"Then I said to him, 'You have had your chance, but you didn't want to take it. You want success and advancement, but you are not willing to take the trouble and work that goes with it. Now, there isn't any use of you going around to these young fellows here, telling them that it is no use for them to work hard, produce more, or try to advance. When you say 'Look at me, I'm right where I was twenty years ago,' the young fellows in this plant can say, 'Yes, we are looking at you. Why don't you come along and take this course with us; probably there is an opportunity for you if you want it.'"

That this particular man was convinced of his error is of little importance. The important fact is that the influence of the discontented man is obviated by the mere facts of the case. It isn't that the management tells the men that hard work and ambition will mean advancement and opportunity; the big thing is that the opportunity really is there. Where the facts of the case are against the discontented man, his views have little chance of spreading. This is very different, however, from merely saying the facts are against him.

While the promotion plan outlined is still in the first stages of development, it offers an interesting example of a concrete attempt to eliminate the monotony of work in present-day industry and to restore to some extent an opportunity for pleasure in artisanship.

The Automotive Industry in Great Britain

THE status of the automotive industry in Great Britain, so far as production, costs and sales prices are concerned, was briefed by Frank Lanchester, the president, at a meeting of the Society of Motor Manufacturers and Traders at London on April 8.

This society corresponds in Great Britain somewhat to the National Automobile Chamber of Commerce, in the United States, and the statements of Mr. Lanchester may be taken as being representative of the great body of the industry in that country. Quotations from the speech have just been received in America.

Lists prices of British cars now show an increase of 95 per cent over those of 1914, Mr. Lanchester said. This figure was reached as an average of some 30 factories, practically none of which has advanced its prices more than double those of the pre-war period. It also represents an appreciable advance in the last few months, as the figures for the latter part of 1919 were shown by the speaker to have represented an advance of some 65 per cent over those of 1914. Factory costs were shown by the following table, which assumed 1914 as a basis.

	1914	1919	1920
Wages	100	200/225	250
Steel, average.....	100	220	250
Castings	100	200	250
Aluminum	100	200	220
Timber	100	300	350

The figures for 1920 do not include the percentage increase that would be caused by the award agreed upon for the engineering union on June 1.

These advancing costs of manufacture would justify a similar increase on the sales value of the cars, Mr. Lanchester said, but they have been held down because of

improved machinery and plants which have turned out a higher production. Additional efforts in that direction, however, were thought to be necessary and the speaker recommended that British manufacturers should endeavor to obtain greater output from each worker.

"For the future," he said, "every effort must be made to increase economic production. An additional output of work per man per day is essential. Labor is beginning to settle down to work, with a better spirit than has been shown during the past twelve months and the recent recognition of piece work and the bonus system by the trade unions also has improved the situation.

"Employers must continue to show the fullest enterprise in the use of all mechanical improvements that would maintain the quality and increase the quantity of output. A further endeavor in the reduction of costs is the system of quantity or 'mass' production. The unification of types, reduction in the cost of car parts and lightening of the load of 'dead expenses' are factors that would reduce the price and benefit the buyer.

"Labor conditions are improving. Men are settling down better. New workers are being drafted into the industry, of whom works managers have reported excellent results but the 'all clear' cannot yet be sounded. Other traders have had, and are having, difficulties that reflected on the raw material supply. The steel manufacturers are unable to cope with the demand, owing to the shortage of coal. There are other troubles, owing to delay with the supply of raw materials as well as transport difficulties, but none is so serious as the shortage of steel."

Comparative Power Properties of Alcogas and Aviation Gasoline

The results of tests with these fuels, using a 12-cylinder Liberty engine under varying conditions, are announced by the National Advisory Committee for Aeronautics. The data obtained from the compression changes, among the other results, are particularly interesting.

By V. R. Gage, S. W. Sparrow and D. R. Harper*

MIXTURES of gasoline and alcohol when used in internal combustion engines designed for gasoline have been found to possess the advantage of alcohol in withstanding high compression without "knock" while retaining advantages of gasoline with regard to starting characteristics. Tests of such fuels for maximum power producing ability and fuel economy at various rates of consumption are thus of practical importance with especial reference to high compression engine development.

Aviation alcogas, prepared by the Industrial Alcohol Co., for trial by the Navy Department and by the latter submitted to the Bureau of Standards for test, was a mixture apparently of about 40 per cent alcohol, 35 per cent gasoline, 17 per cent benzol, and 8 per cent other ingredients. This is not the alcogas prepared for commercial or passenger-car use. The exact composition and methods of manufacture are a trade secret.

*Abstract of Report No. 89 of the National Advisory Committee for Aeronautics.

The tests made for the Navy Department consisted in a direct comparison in a 12-cylinder Liberty engine, between alcogas and standard "X" (export grade) aviation gasoline with respect to maximum power attainable, and

fuel consumption with the leanest mixture giving maximum power. The tests were made in the altitude laboratory of the Bureau of Standards, where controlled conditions simulate those of any altitude up to 30,000 ft. The speed range covered was from 1400 to 1800 r.p.m. and the altitude range from ground level to 25,000 ft. Two series of comparisons were made, one with 5.6 compression ratio pistons and one with 7.2 compression ratio pistons. The actual compression pressure as measured at 900 r.p.m. was about 125 lb. p. sq. in. with the 5.6 compression ratio and about 170 lb.

with the 7.2 compression ratio. The physical properties of the two fuels used in these tests are given in Table I and Fig. 1.

The manner of conducting the tests was, briefly, as follows: The engine was started on one of the fuels,

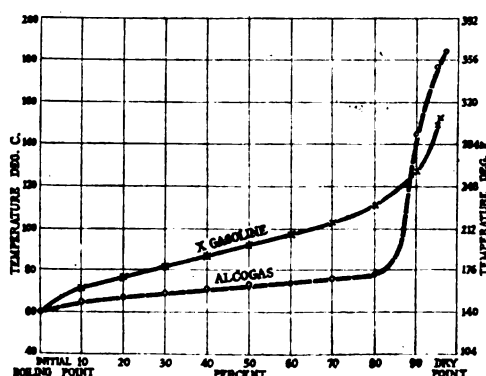


Fig. 1

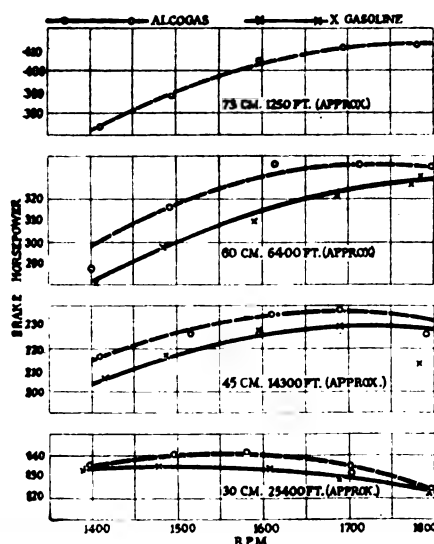


Fig. 2

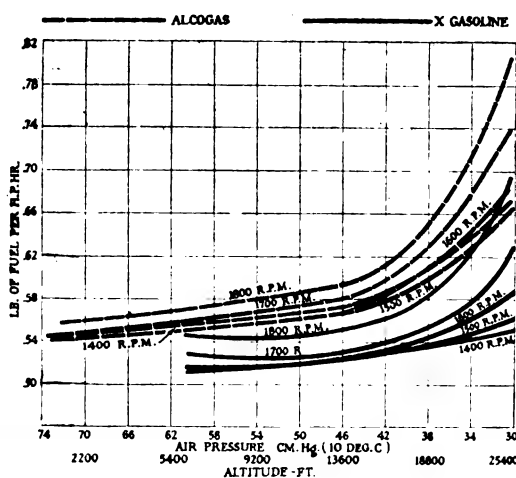


Fig. 3

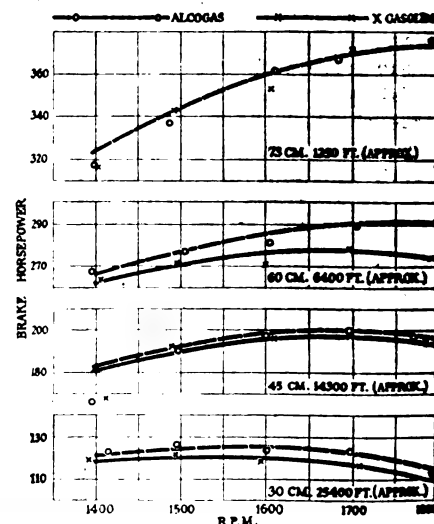


Fig. 4

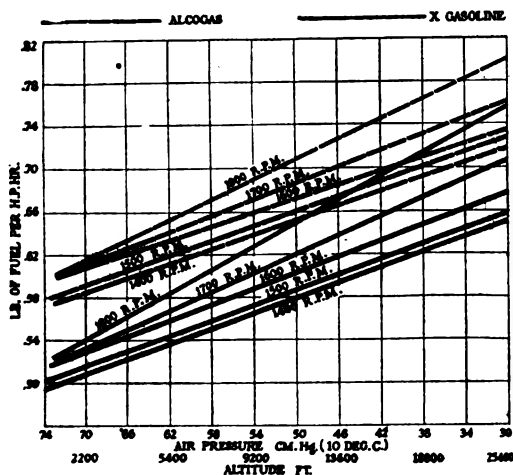


Fig. 5

TABLE I

DISTILLATION AND OTHER PROPERTIES OF ALCOGAS AND X GASOLINE

	Aviation Alcogas	X Gasoline
Heating Value (Total)	15,910	20,340
B.t.u. per lb.	15,910	20,340
Calories per gram	8,840	11,300
Appearance	Clear lavender	Clear water white
Odor	Alcohol and ether	Gasoline
Specific gravity at 15.6 deg. C., 0.799	0.799	0.710
Reaction to litmus		Slightly acid
Corrosion		Black deposit
Gum per cent		0.02

and the air, load, speed, oil, jacket, etc., conditions were adjusted. Starting with a mixture known to be rich, the fuel supply was gradually reduced and the maximum torque noted, the "leaning" of the mixture being continued until the torque was appreciably below its maximum value; then the fuel flow was increased only enough to obtain again the maximum torque. All the data in this test were secured with engine throttles wide open. When conditions and adjustments were as desired, observations were made of the speed, load, various pressures and temperatures and quantities, while the time required to use a certain weight of the fuel was noted. At the end of the run on one of the fuels, the valves were turned so as to supply the engine with the other fuel. After sufficient time to be sure that none of the

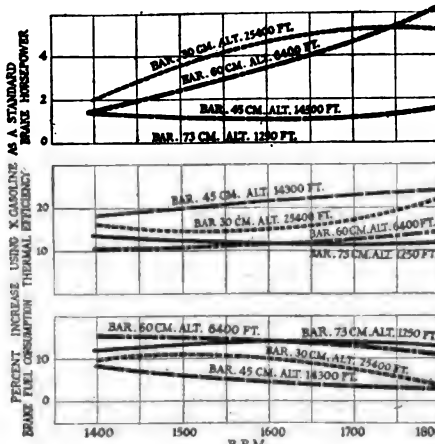


Fig. 6

previous fuel remained in the line unused, the carburetor was again adjusted for maximum torque with minimum fuel, in the manner described above. By following this procedure, there was little chance for any change of engine condition to enter into the comparative results from the two fuels. After the tests with ordinary (5.6) compression ratio, the engine was taken down, the special 7.2 compression pistons were put in, the engine was thoroughly cleaned, overhauled and some replacements of parts made. This overhaul had no influence on the comparison of the two fuels with either one of the compression ratios, all such comparative runs being made according to the procedure just described, which eliminates engine changes.

Other comparisons, such as that of the engine performance under different compression ratios, may be affected to some slight degree by the overhaul, and deductions from slight data will not have quite as high a degree of accuracy as they would from a test conducted with primary attention to constancy of engine conditions.

It should be noted that the rather marked reverse curvature of the heat balance curve, showing percentage of heat in exhaust, is undoubtedly a real reversal with altitude and not a mere accidental coincidence of some undetermined cause depressing or raising values. This conclusion is partly from results of other tests (with different fuels) where in numerous instances evidence has appeared that most complete combustion of fuel is secured at conditions corresponding to the altitude of 10,000 to 15,000 ft.

Brake Horsepower.—The alcogas shows a better maximum power producing ability than X gasoline at all speeds and altitudes, except at ground, the maximum difference being 6 per cent. At ground level, the two fuels gave the same result at 5.6 compression, while at 7.2 compression, comparison was omitted because of the tendency of gasoline to knock at such high compression. The most common difference, omitting the extremely high and low speeds, and considering all altitudes, is about 4 per cent, which may be accepted as the figure for superiority in brake horsepower of alcogas over X gasoline.

Fuel Consumption.—The gain in power producing

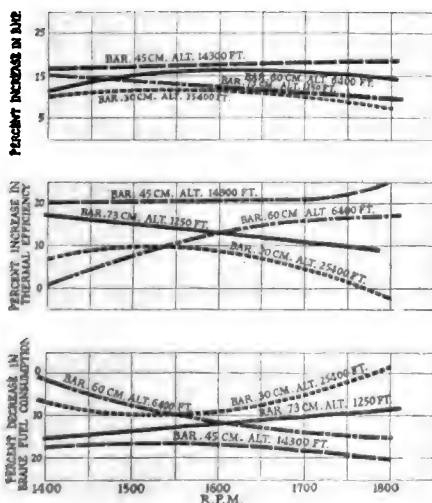


Fig. 7

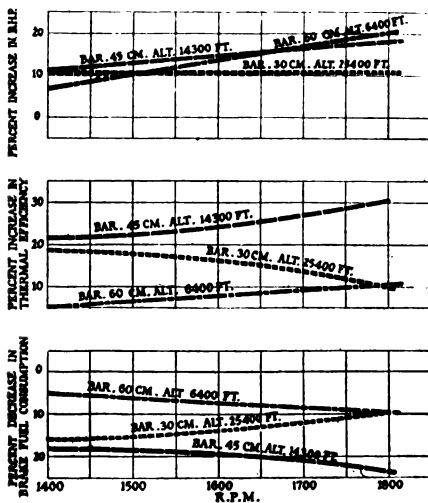


Fig. 8

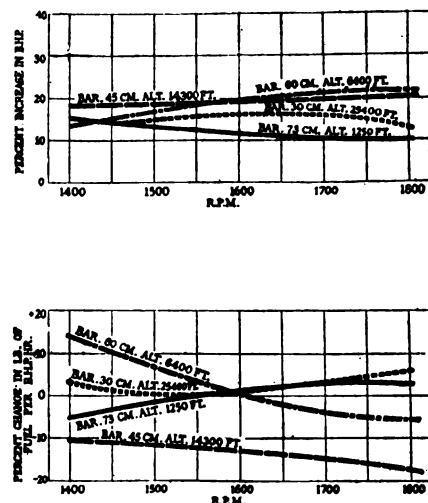


Fig. 9

ability noted above for alcogas is at the expense of considerable increase in fuel consumption, the differences reaching 20 per cent. The general average is an excess consumption, per brake horsepower, of alcogas exceeding 10 per cent (by weight) at 5.6 compression ratio, and nearly 15 per cent at 7.2 compression ratio.

Thermal Efficiency.—Alcogas shows about 15 per cent higher thermal efficiency than gasoline. Stated in terms of brake thermal efficiency of an engine, 15 per cent superiority of alcogas over gasoline means that if an engine using gasoline has a thermal efficiency of 25 per cent, it would have an efficiency of 28 to 29 per cent with alcogas.

Comparisons of Alcogas and X Gasoline by Volume.—Alcogas is 12 per cent more dense than gasoline; consequently all the above figures are very different when comparison is made on the basis of the pint or gallon as a unit instead of the pound. The maximum brake horsepower attainable is independent of this unit, so that the figure is 4 per cent as before. The excess fuel consumption per brake horsepower of 10 to 15 per cent of weight, becomes practically zero on the volume basis. The total heating value per gallon of alcogas is about 106,000 B.t.u. and of gasoline 120,000 B.t.u., a difference of 12 per cent referred to gasoline as a base, instead of 22 per cent difference as by weight. This figure is seen to be of the same order of magnitude as the difference in thermal efficiencies of the fuels. Computing the effective useful work obtainable (product of B.t.u. supplied and thermal efficiency) it is found to be the same from a gallon of either alcohol or gasoline.

General Engine Performance.—While there is no tangible method of comparing the "smoothness" of operation of the engine, the testing staff felt that alcogas gave a "smoother" running engine at all times than did the X gasoline. No tests were made to determine the condition of the engine after continued use of alcogas fuel, but no evidence was found of any evil effects.

Apparently the change in compression ratio has about the same effect, no matter which of the two fuels is used, until the temperature and pressure conditions are such as to cause poor engine operation with gasoline. The main advantage of alcogas seems to be that it is known to be free from tendency to knock on ground level when using the 7.2 compression with wide open throttle.

It is safe to state that the increase of brake horsepower at 7.2 compression over that at 5.6 compression averages at least 10 per cent for all speeds and altitudes and that the fuel economy for maximum power is improved, so that the fuel consumption per brake horsepower and the thermal efficiency are at least 10 per cent better with the higher compression.

Since a 7.2 compression is generally considered too high for gasoline fuel, it is of interest to compare the engine performance with alcogas at this compression with its performance with X gasoline at the 5.6 compression. An examination of this comparison shows that alcogas with the 7.2 compression pistons gives a general average of about 15 per cent more power than X gasoline with the 5.6 compression pistons. The pounds of fuel per unit power is about the same, perhaps favoring slightly the use of alcogas with the higher compression.

Schroeder Flowmeter for Measuring Gasoline Feed

MAJOR R. W. SCHROEDER, of the Airplane Engineering Dept., McCook Field, whose altitude flight recently caused wide comment, is the inventor of a flowmeter intended for measuring the flow of gasoline to an aircraft engine. This meter, by a few changes, may be adapted for use on automobile or other engines.

The meter is of the variable orifice type. It consists essentially of a vertical glass tube about 1 in. in diameter, containing a graduated metal tube having a narrow vertical slot. A light cylindrical metal indicator slides within the metal tube, the variable orifice being formed by the part of the slot which lies below the indicator. The glass tube is closed at each end by a small bronze fitting, the joints between the tube and fittings being packed by cork gaskets.

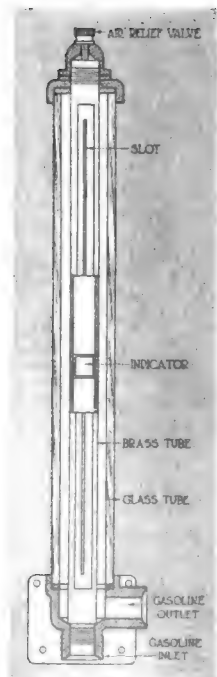
The lower brass fitting carries the plate by which the meter is fastened to the plane and also the intake and discharge connections. A cross-section of this fitting is shown herewith.

Referring to illustration, the operation is as follows: Gasoline under pressure from the supply system enters the bottom or intake connection of lower brass fitting. When the meter is first started, the air relief valve at the top is opened and all the air in the meter is allowed to escape, after which the valve is closed and the meter, being full of gasoline, is ready for operation. The gasoline flows into the bottom of the graduated tube and lifts the light metal indicator until enough of the slot is uncovered so that the indicator is in equilibrium. The height of the indicator is a measure of the rate of flow of gasoline passing through the meter. After passing through the slot, the gasoline flows into the glass tube and is discharged through the outlet at the side of the lower fitting. As designed for airplanes, the meter is 11½ in. over-all, with a 1 in. diameter glass tube.

To ascertain the value of this instrument and its accuracy, as well as to determine its calibration, a series of tests were made at McCook Field. It was found that the metering was correct in a vertical position. When climbing or diving at 30 deg. the greatest error amounted to 0.04 gal. per hr., which is practically negligible.



Photograph of Schroeder flowmeter



Sectional view through the Schroeder flowmeter



The FORUM



Advertising Quality

Editor AUTOMOTIVE INDUSTRIES:

ANSWERING your inquiry as to our opinion of the value of "artistic" advertising as exemplified by our recent booklet, I will turn the question to say: Does it pay to get out the kind of advertising we distribute?

The editor has special reference to our booklet advertising; it is just as well to add here that we use considerable magazine space and that in this we strive toward the same goal as in our booklet advertising, though they differ greatly in method. The booklet gives the widest possible latitude in the design and composition of the message you wish to deliver. You can make your booklet just what you wish it to be. The magazine advertisement, on the other hand, is restricted by size, and by numerous other considerations. The magazine advertising page is valuable because it reaches a greater number at less expense, though with not as complete a message, than will your booklet. Both must therefore be used for proper results.

A booklet or other piece of advertising literature has one main purpose: to acquaint people with your product and to make them desire to buy. There are many ways of doing this, depending on the nature of the product, its use, cost, etc. With us getting out a booklet means not only to tell what we make, but to tell also how it is made, the materials used, why it is made the way we make it, what sort of people actually make it, and what kind of a plant it's made in. You will see that in our literature we try to give a reader all the information about our product that he could get for himself if he made a visit to our plant and inspected every department.

Our literature must measure up favorably with the products we make, which the booklet is meant to advertise. This literature ought to reflect the products; the least it can do is to truly represent them.

If the product is made by high grade, skilled workmen; if it is made of material of highest quality; if it is made to meet a standard and not a price; if it is made by men who like to make it, who work in a plant that is beautiful as well as efficient—then in justice to these men and their product the facts ought to be made known. It's up to the advertising department to do it.

The Clark Equipment Company has a plant of which every man in the organization is proud. We have an unusually fine bunch of men running our plant. They know that these motor truck axles must stand up under severe service. They know that they must turn the wheels of motor trucks valued at several thousand dollars. They know that their tools have made a reputation and they mean to uphold that reputation. The name Clark and "Celfor" means much. To them it means that our products are the best of their kind and made in the best way they know how to make them.

The advertising department must do justice to all these factors when addressing prospective and present users of our products. That means that we must put out some good-looking and expensive booklets. We reach only a selected few with our booklets, but we reach those few as we want to reach them, with all we've got, and it

pays. All we actually do in our booklet advertising is to bring our entire plant to the desk of the man interested in what we make. Having done that we feel we have done everything possible. The result is well worth the effort.

E. W. CLARK,

Advertising Manager, Clark Equipment Co.

A Non-corrosive Flux

Editor AUTOMOTIVE INDUSTRIES:

IN reference to the paragraph in *Automotive Industries* of April 8 regarding soldering flux, the following information may be of interest:

There is no absolutely non-corrosive flux on the market, but the nearest approach to this ideal is probably attained by the use of a compound composed of rosin and stearic acid. The Naval Aircraft Factory has been using, for some time past, a flux composed of 75 per cent stearic acid and 25 per cent rosin. It is practically non-corrosive but it is not quite so powerful as the commercial fluxes; at the same time it is very satisfactory if the men do not expect to rely on it to actually CLEAN the surfaces.

I would suggest that your correspondent write to the Bureau of Construction and Repair of the Navy Department, requesting a copy of "Aeronautical Specification No. 116A," which covers the requirements for this flux.

The average commercial flux is composed largely of ammonium chloride, although the manufacturers sometimes claim to have a "secret" composition. Ammonium chloride is very hygroscopic thus causing accelerated corrosion in the presence of moisture.

ARCHIBALD BLACK

Automobiles on Railroads

Editor AUTOMOTIVE INDUSTRIES:

WE are much interested in the article entitled, "Solving the Problems of the Railway Motor Car," which appears on page 21 of your Jan. 1 issue, as we have been making a line of special equipment for use in putting an automobile truck on the railroad track.

We have been in this line of work for a number of years and our experience has been that it is necessary to put a pony truck under the front end in order to operate an automobile with any degree of safety on the railroad track.

We have found also that the passenger or touring car, as shown in the upper right-hand corner of page 21, will not stand up in this service, as the axles will become crystallized and break in service, due to the constant jar and vibration to which they are subjected in railroad service.

CLIVE HASTINGS.

Correction:

THREE blind advertisements on lubrication appeared in the advertising section of *AUTOMOTIVE INDUSTRIES* on the following dates, Feb. 26, March 4 and March 11, and in each case the word "advertisement," which should have appeared at the bottom of the page was omitted by mistake.

Economic Situation in the Far East Makes American Car Market

An American editor and writer of Yokohama has written this article for the purpose of showing how interior conditions of Japan and China make them a worthy export field, the greatest drawback, of course, being the lack of better roads. This article surveys these markets.

By Roderic C. Penfield*

WITHIN the last five years, such countries as Japan and China, heretofore a by-word, especially the latter country, for poverty and cheap living, have added enormously to their financial resources. Particularly is this true of Japan, which before the war had barely twenty million yen above the lawful reserve, but now has probably over two billion.

As in Occidental countries, the Orient is feeling the high cost of living. Wages have almost trebled and so even a small margin for saving or expenditure for goods other than necessities, has greatly enlarged the Japanese purchasing power. Moreover, the natives of Japan and China have acquired a yearning for the comforts and conveniences that obtain in the United States. Their tastes for better homes, better clothing, more amusements and more facilities for business have been developed through travel in the United States and elsewhere. Every Japanese who comes to the United States goes back a potential salesman for everything American, from neckties to motor cars.

There are altogether in Japan approximately 5,000 cars of all types; in China, perhaps less than half of that number. Tokio has its "automobile row," where some ten or a dozen concerns have showrooms and maintain cars in stock for sale, as well as carry on garage and repairshop work. In addition to the establishments in that locality, there are others in various parts of the city. In Yokohama, there are several large garages, and in Kobe, where the foreign element is also in strong evidence, garages and repairshops are considerable in number.

The chief obstacle heretofore to rapid growth of the motor industry in both Japan and China has been the lack of good roads. A campaign is under way in Japan for the improvement of the highways in the neighborhood of the large cities. Travel between Tokio and Yokohama is now maintained along a narrow road. For the 18 miles between the two cities, except about four of which are through country, the roadway is lined on both sides with houses, small factories, etc. This makes traffic slow and exceedingly liable to accident, as dogs, children and grown persons are alike careless in permitting motor cars any right of way.

A new road is to be constructed entirely separate and apart from the one in existence, at a cost of about \$2,500,000, and it will greatly facilitate motor traffic of all kinds between the two cities. Yokohama, being the seaport for Tokio, naturally makes necessary a great amount of merchandise and general travel to be carried on between the two cities.

When incoming freight for Yokohama is released in the Custom House, it is taken to Tokio in three ways: by water, steam train and wagon. The former frequently requires a long haul at the Tokio end, and, in many cases, this also applies to freight sent by railroad, which requires hauling at both ends. The Japanese realize that freight, by being loaded on trucks at Yokohama, can be delivered more cheaply and expeditiously directly to the door of the owner in Tokio than by any other method. Moreover, there are a great number of large and small towns in Japan not reached by the steam trains, and the motor truck offers a solution to such a problem that cannot be overlooked.

The Japanese chauffeurs are, as a class, poor mechanics and rather resent having to take care of a car. The result is that a car ages in about one-third of the time that it does in this country unless the owner himself sees to its proper maintenance. Moreover, the Japanese chauffeur realizes that, if he makes his own repairs, there is no chance for the "rake-off" that he will undoubtedly collect from the garage and that, while the car is under repair he is, of course, enjoying a vacation at the owner's expense. This state of affairs unquestionably will be remedied and perhaps it is, after all, only a stage similar to that in Occidental countries during the first stages of the motor's career.

In China, the chauffeur receives a monthly wage of about \$25. For that he simply drives the car, paying out of his salary a coolie to wash the machine whenever necessary and another coolie, of a higher grade, to keep the car in order. In Japan, the chauffeur's salary is from \$35 to \$45 per month. Now and then one is found who takes an interest in the car and keeps it in good order, but most of them limit their attentions to washing and polishing it and putting oil in the most convenient grease cups.

There are many cars in Japan owned by natives who have acquired sudden wealth through various war transactions. Most of them buy the chassis and have closed tops built. Such tops are constructed entirely of wood and are an excellent imitation of the bodies sent out from this country. A body for a five- or six-passenger car costs about \$600, and there is thus a considerable saving over bringing the car complete from America, the saving being not only in the cost of the body but also in the freight.

In China, the majority of the cars are the touring type and are imported complete. Probably three-quarters of the cars used in China are of American make, the English and French factories not having been much in evidence before the war and, of course, shipping practically nothing to the Far East during the war.

*Of the World Salesman, Yokohama, Japan.

Nearly all the important American cars are represented in Japan. Contracts for at least a dozen makes hitherto unknown there have been signed in the last two months. The cars most seen are, of course, the Fords. There are several hundred of these in the taxi service in Japan. Others much in use are the Buick, Hudson, Overland, Oakland, Studebaker, Chandler and Chevrolet and additional makes are being introduced.

The motor bus service inaugurated a year ago in Tokio is doing well. It is being enlarged. Systems for Yokohama and Kobe are also being negotiated.

In China, the variety of cars is not as large as in Japan. The great drawback is the lack of good roads. There are but a few thoroughfares practicable for passenger cars radiating from Shanghai and the same may be said of Peking. The eighty-mile roadway planned between Peking and Tientsin is not completed but, when it is, it will probably give a great impetus to the automotive industry in North China, as again it is a case of where goods could be loaded from the customs dock at Tientsin at night and delivered the next day at Peking. Now, it is a matter of long hauls at both ends, with much delay from other sources.

China, once famous for her excellent roads, is now a by-word for execrable thoroughfares, no money having been spent on them for many years. In driving over a road three or four miles outside of Peking, I observed that it originally had been paved with blocks of stone about 1 x 2 ft. Many of them had sunk or been broken, and the result was that, although the chauffeur tried to pick a way by which we would not be jolted too much, he was simply unable to do it. In every few feet, there were probably two or three stones that had sunk several inches, with the result that we not only had to crawl along but were badly jolted about. The effect upon the car may well be imagined.

When I was in China last summer, I was told that the

plan was, upon the demobilization of the army, to put many of the men at work in establishing a new system of roads throughout the most thickly settled parts of the country. A man to whom I talked scoffed at this idea and said that the army would never be demobilized but, as a loan of \$25,000,000 is being negotiated with America for the express purpose of paying off and demobilizing the soldiers, it looks as though a definite attempt to improve the roads of that vast country might soon be under way.

What the development of good roads in China and Japan will mean to the American manufacturer of cars and equipment, is almost beyond comprehension. Moreover, the extensive system of canals in both China and Japan make for a good market for marine engines and accessories.

Although the price of gasoline is about \$1.10 a gallon through the Far East, nevertheless, at the present ascending scale of wages passenger cars and trucks have a bright future. It is probable, however, that many of the vehicles will be equipped to burn a low-grade fuel in conjunction with gasoline, thereby reducing the fuel expense.

The long distance from this country will make it necessary to maintain large stocks of equipment in the principal cities. Until the native chauffeurs are educated to care better for the cars, the demand for parts and accessories will be much larger in proportion than it is in the older countries.

The present difficulty with exchange rates between Europe and America does not obtain in the Far East. In fact, the exchange now is decidedly against the United States. This makes it desirable for those in the East who have money to spend, to spend it now and, from all I know of the foreign trade situation, that is exactly what the shrewd and clever Japanese and Chinese are doing.

The Japanese Ford

BODY designs of American automobiles that are exported to foreign countries result frequently in a car that seems scarcely to resemble a car of the same make in the United States. The changes, of course, are made to meet the foreign conditions and sometimes arise from peculiar and almost unexpected reasons.

The photograph herewith is an instance in point. It is a three-seater Ford that carries six passengers. The Ford exporters to Japan—Sale & Frazar—ascertained that the Japanese required less foot-room than do the Anglo-Saxons and they learned also that the Japanese like to crowd more passengers into a car than is the practice

in America. Consequently, the three-seats were accomplished by lengthening the body approximately one foot, by decreasing its width slightly to conform to the greater length and by making other slight alterations. The rear seat is not served by a door, the passengers entering through the middle seat, in a fashion similar to some of the four-seater American cars.

The body for the Japanese car shown here was built in that country, only the complete chassis being imported.



Ford chassis equipped with three-seated body built in Japan

Bakelite Propeller Put to Severe Test

MAJ. WILLIAM OCKER flying a DH-4 Goldbug from Aberdeen, Md., to Washington, D. C., equipped with the new Micarta or so-called Bakelite propeller put this propeller to a most severe test. Bolling Field had been in a very bad condition for about two weeks, the mud being 12 in. deep. Landing with a DH-4, which has a high landing speed, in mud is a particularly dangerous undertaking.

Hardly had his wheels touched the ground when his plane nosed over. Before he could reach for the switch to cut off his engine the propeller succeeded in churning around in the ground several times. The force of this churning was so great that it threw his plane back into position while the wheels sunk down to the hub in the mud.

When an examination of the propeller was made it was found to be in perfect condition and not even chipped.

Meeting the Radical with Understanding and Agreement

In one day, Mr. Tipper received four requests to join societies "to combat something, to fight something or to stop something." To these, the reply was that he would prefer organizations "to understand something, to agree upon something and to produce something." His article this week, based upon that theme, should command the widest attention.

By Harry Tipper

THE railroad strike has brought out more clearly than ever our tendency to take sides upon a subject without any consideration of the reasons for the difficulty or the justice or injustice of the demands. We are, frankly, very tired of interruptions: we are thoroughly disgusted with the inconveniences we suffer on account of these interruptions: we are disturbed by the continual tendency of groups of men to give up their work and make it difficult for us to continue our own operations. We recognize that we cannot continue the present industrial organization if we are to be held up at every turn by the disagreement between employees and employers and the total disregard of the public necessities. So, our disgust is finding its expression in the increase of volunteers to take the place of strikers where the interruptions are important; in the organization of vigilance committees and in activities concerned with the protection of our food supplies and other necessities in case further disagreements occur.

Unquestionably, the methods of the strikers in the railroad trouble were bad. They struck without any previous demands having been scheduled, without warning and without giving the public any opportunity to express itself. They struck because of differences with their own leadership just as much as their dissatisfaction with their work. On the other hand, the only time the public has shown any tendency to inquire into the causes of the strike has been when the circumstances of the strike have seriously alarmed the general public because of the possible consequences. Hundreds of strikes have occurred without any public interest at all. Thousands of other strikes could occur without any show of interest outside of the parties involved; either in the justice of the matter or in the obligation for a fair settlement.

So soon as the public necessities have been intimately touched by a strike and have alarmed the people because of this fact, the interest of the public has been aroused. Even then there has been little discussion of the merits of the cause, but simply an endeavor at protection against the difficulties imposed by the strike. These things are to be expected, of course, and it is absolutely necessary that the public welfare should be protected against interruptions by bodies of workers, even though such workers may have reasonable cause for complaint.

These things, however, do not improve the situation. They afford a temporary relief from the difficulty, but they do not take the place of a just examination and they

do not increase the good feeling between the parties, nor lead to any expectation of better judgment over the next disagreement. There is no doubt that the dissatisfaction of the yard men and switch men was due to the dilatory methods of the Government in considering their position with respect to other railroad workers. This was not improved by the time consumed in the appointment of the Conciliation Board appointed by the bill which passed through Congress on the return of the railroads to their private owners.

As a matter of fact, this board was appointed after the strike commenced. The workers feel that the strike had something to do with the speedy appointment of the board and they feel that the strike was partly justified by that result. However that may be, the purpose of calling attention to the public interest in this matter is to point out that in our alarm and our desire to get through with these interruptions we are in danger of adopting foolish and hastily considered measures of repression or combat, which will simply sharpen the issues, lead to a clear definition of party and opinion and perhaps develop into a repression which is not desirable to contemplate.

There are several bills in Washington which would limit free speech if they were literally interpreted, and they might be interpreted to such a degree that they would amount to tyranny. Following the expulsion of the Socialists from the Assembly at Albany, bills have been introduced in that Assembly which could be so interpreted as to place the opinions and the convictions of every citizen under the control of the politicians or the judiciary erected to examine and enforce these acts.

New organizations are springing up every day with the purpose of combatting radicalism as it is called, and speeches, and propaganda which emanate from some of these organizations show a dangerous tendency to despise all liberal opinion, to classify all suggestions for improvement as socialistic and to demand complete suppression of activities which vary from the *status-quo*. Of course, it is not likely that these various bills will come through, nor is it likely that if they become law they would pass the court test as to constitutionality.

They are important because they illustrate the activity of an influential body of opinion, determined upon getting through with the present unrest and interruptions, without any understanding of the danger to democratic or free institutions in the adoption of such methods. Even this danger would not be important if the public were interested in really

studying the cause of this unrest and arriving at a judgment on the facts. The danger arises in the general tendency to arrive at opinions without study and largely on the basis of fear or annoyance.

These things affect industry because the suppression of strikes will not remove the unrest. The suppression of these strikes may remove the interruption and may enable us temporarily to pursue our business without the inconvenience and difficulty which has been attached to it for some considerable time. Nevertheless, the sentiments which caused the strikes will not have disappeared with their suppression and it will not have been changed simply by the difficulty.

It would be a most excellent thing for industry if the disagreements in each strike would be thoroughly aired in public. It would be a wonderful thing if the newspapers would investigate the facts of each case and point them out to the readers. Each such investigation and each such illumination of the facts would bring us nearer to an understanding of the matters involved and would make it possible for the whole discussion to continue with an increasing common groundwork of knowledge as to the fundamental necessities of industry and the fundamental limitations of Government.

There was never any fight that did not leave a trail of bitterness behind it and the longer we fight on subjects concerned with industrial operation, the more difficult it will be to get together upon any reasonable basis of understanding. Already the bitterness and suspicion involved are enough to make it a matter of patient, farsighted policy and careful action, before the individual manufacturer can hope to transfer some of the loyalty of the worker from his craft to his organization and to imbue him with a sentiment of individuality sufficient to give him an incentive in his work.

Fortunately, the patient consideration of these matters is being worked out in a sufficient number of individual factories to show the possibilities contained in the proper study and endeavor. Publicly, however, we seem to make no advance in this direction. We lose entirely our human point of view when we pass from the intimate knowledge of human beings in our own surroundings to the abstract discussion of human beings in groups.

When we speak of an individual workman, "Smith," whom we know, we are obliged to admit that he has many good qualities, and when the worker Smith speaks of his boss, whom he knows personally, he is obliged to admit the same thing. When we substitute the word Labor for Smith we lose all sense of the human equation involved and consider it in the abstract vaguely as a force moving mechanically in a certain direction, with a definite strength of action without human qualities and oblivious to human understanding. When the worker substitutes the word Capitalism for "Jones," his boss, he considers it in the same way.

In this mass operation of industry and this group necessity of government which has grown up in the last century, we have learned to talk and to think glibly about labor, capitalism, socialism, radicalism and other abstractions as though they were definite entities to be measured and treated separately and apart from the individuals who composed them. We have almost lost sight of the individual entirely and are no longer capable of measuring the conditions as due to the individual and the individual equations. We have altogether lost sight of the fact that our progress in understanding must be a progress from the individual to the group and

not from the group to the individual. Individuals get together for common purposes and the groups change as the individuals within those groups become aware of different necessities and are forced to recognize different conditions.

To attack any group as a whole is simply to consolidate and to make it more powerful. The history of the trade union shows that it had better discipline and was more powerful (considering the number of its members) when it was bitterly opposed than it has been since it gained its recognition. The unity of its purpose has disappeared to some extent and its discipline has declined, as indicated by the internal division and by the lack of unity.

It is discussion, a larger measure of agreement and a much greater measure of understanding which will turn the fighting groups into the productive groups that are necessary for the development of industry, and the understanding must come to the individual and to a sufficient number of individuals in the different groups, so that the groups themselves are modified by the individual development.

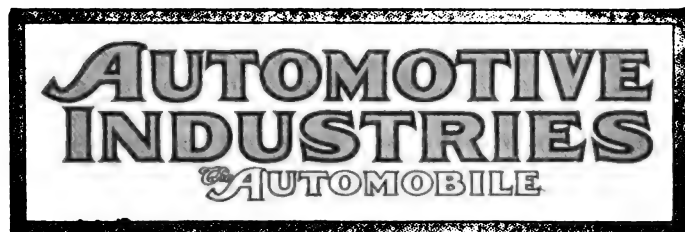
Industrially and in politics, we are talking too much about fighting in our anger at the interruptions and far too little about understanding and agreement.

In one day's mail there came to my desk four requests to join associations or societies to combat something, to fight something or to stop something. It is about time that these were changed so that they were requesting me to join associations with the endeavor to understand something, to agree upon something and to produce something. In this respect, industry at least is further advanced than Government and, while many industrial establishments are getting a better measure of understanding, a better spirit of agreement in their establishments, the politicians are introducing more measures of repression, more suggestions for prohibition of various things and more attempts to crush opposition instead of educating it.

Industry is very deeply and very intimately concerned with the action of the politicians, because these actions are likely to have a very large effect upon the unrest, which will find its expression through industry. The economic program of politics is growing and shows a tendency to grow. The spirit of its suggestion is not the spirit of development, and industry is likely to be retarded more seriously by the actions of the politicians in the future than in the past, unless industry proceeds with its work of educating the people and the politicians to the necessities and the requirements of the case.

Outlaw strikes are likely to occur again. There is a division in labor politics which is increasing and confidence in the leaders is not as complete as it was. The conditions which industry will have to face are not likely to decrease this division among the various organizations concerned with labor. Unless there is an increase in the development of understanding between the employer and his own employees these divisions are likely to prove more embarrassing than the unified control of the American Federation has been in the past. When there is no unity among the workers, or there is a division in respect of opinions as to their leaders and their program, it will be more difficult to deal with them unless the manufacturer has learned to deal with his own employees in connection with his own problems.

Education and understanding are the road to the matter and the manufacturer is in a better position to operate these things in respect of his own employees. His business depends upon the unity he can establish in his own organization.



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Aiming at Something

THE ultimate effectiveness of any department in a manufacturing concern is dependent to a large extent upon the work and co-operation of many other departments.

The man in charge of "welfare" work in a large New England automotive plant recently talked to an inquiring visitor enthusiastically and at great length concerning the bands, the baseball teams, the bowling leagues, the picnics, checker tournaments and other forms of employee activity which were being promoted by the company under his supervision. There was no doubt in his mind but that these activities had a very direct and significant effect in keeping the employees contented, in reducing labor turnover, and in increasing production.

The inquiring visitors later talked to the employment manager of that same concern, seeking to find verification in actual figures and in the experience of this official, who was in close contact with the labor condition and difficulties of the organization. When asked whether or not the plant welfare work had much influence upon labor turnover, he said: "As

far as my experience goes, it has very little, if any, effect upon keeping men with the plant for a greater length of time than they would otherwise remain."

Thus was brought to light not only a difference of opinion but a faulty organization. Personnel work must be aimed at something—if it is not aimed it will not arrive.

France's Industrial Difficulties

FROM reports in the press, it is evident that the French automobile industry is meeting with all sorts of difficulties and is as yet hardly in production, although nearly a year and a half have elapsed since the signing of the armistice. As substantiating this point, the American agent for a car produced by one of the largest aircraft engine manufacturers in France, who received his first car a fortnight ago, said that as far as he knew this was the first car completed by the firm.

The backwardness of the French industry has been a topic in press discussions and various reasons have been mentioned to account for it. In this connection it is well to point out that prior to the war France had the largest automobile industry in Europe and did the largest export business in automobiles in the world. As the manufacture of automobiles for private account was entirely stopped at the outbreak of war, an enormous potential market has undoubtedly developed in that country, and even in spite of the fact that the French Government took over the entire automobile equipment of the American Expeditionary Forces and disposed of it to the general public, there must still be a large market for passenger cars. But, in spite of this pressing demand, the factories are turning out very few cars. It is true that the French factories were struck harder by the war than any others, with the exception of those of Belgium. They had to change over from automobile production to the production of munitions in a day and the minds of their staffs were turned away from automobiles for the next four years and a half, during which time, no doubt, some of the technical organizations went to pieces.

But all this would not account for the slow comeback of the factories. If it had not been for factors which became operative only after the cessation of hostilities, the factories should have been in full production at the beginning of the current year at the latest. There have been three factors which have been holding them back; all of these are more or less interlinked and might be grouped under the general heading of economic difficulties. The first is the restlessness of labor, which is due in large part to the high cost of living and finds expression in frequent strikes; the second is the scarcity of coal and raw materials, and the third is the adverse rate of exchange. As long as the war lasted immense quantities of raw materials and manufactured goods were poured into France, the imports being financed by foreign loans. When the war ended the loans ceased, and as the imports continued it was not long before the franc fell to a fraction of its nominal value. The low rating of the franc would be a help

in disposing of French goods in foreign countries but until the products have reached the marketable stage it is a decided handicap.

The French makers are chafing under the handicap of the adverse exchange and some radical means of eliminating it have been proposed. But the disease of which the unfavorable exchange is the outward manifestation is a deep rooted one and the cure can be effected only slowly.

Similar Laws but Different Meanings

WHETHER it is the front lights or the rear lights which are "visible in the direction in which the motor vehicle is proceeding" is a point raised by the conflicting laws of different States. The Alabama law bearing upon the point is as follows:

"The rays of such rear lamp shall shine upon the number plate carrier on the rear of such vehicle in such manner as to render the numerals thereon visible at least 50 ft. in the direction in which the motor vehicle is proceeding."

In the following extract from the New York law practically the same language is applied to head-lights:

"Except as otherwise provided in this section, such front lights shall be visible at least 250 ft. in the direction in which the motor vehicle is proceeding."

The confusion of ideas seems to be due to the different positions supposed to be occupied by the observer. "Visible from a point 50 ft. to the rear of the vehicle" would establish with sufficient accuracy the position of the observer of rear lights in Alabama. "Visible from a point 250 ft. ahead of the vehicle" would determine the position of the New Yorker observing the headlights of an approaching automobile. It might be remarked also that a lighted match would be visible 250 ft. ahead of the car and that scientific terms are needed if the candle-power is to be fixed.

Such inaccuracies of the law may seem trivial, or even amusing, until some vital case in court hinges upon a mere interpretation, when the matter appears more serious. Uniform laws are worth considering in this connection. The present status of the laws of the several States is a hopelessly entangled mass of unintelligible verbiage.

One Wage Increase Since 1848

THE automotive industry should be especially interested, at the present stage of development, in a better and more efficient Patent Office. A recent report on the status of the Patent Office said that there had been only a 10 per cent increase in salaries for the expert staff of the office since 1848.

The Commissioner of Patents, J. T. Newton, explained that under present circumstances he is unable to hold good men as examiners. About the only reason competent men accept such positions to-day is to get the experience necessary for entering the employ of patent attorneys or commercial firms requiring

such experts. As a result, the work is coming out slowly because the men are not familiar with the routine, and reports on pending patents are far behind.

Recently a bill was passed by the House of Representatives which would do much to relieve this condition and make the office more efficient, if it becomes a law. The bill is before the Senate and favorable action is hoped for, but it might be well worth while for manufacturers and organizations, which are so greatly interested in patent work, to call the attention of Senators to this need. It is rather unusual that the Patent Office has never been an expense to the Federal Government, as it is one of the few departments that always has paid a profit on its operations. The bill under consideration raises the fees somewhat, with a view of keeping the office on a self-supporting basis.

Cylinder Wear

ORDINARILY the wear of a gas engine cylinder is greatest in a plane at right angles to the crankshaft because in this plane occurs side thrust on the cylinder wall due to the angularity of the connecting rod. If the engine is well designed and well made there is no pressure of the piston on the cylinder in the plane of the crankshaft; there is, of course, the pressure of the piston rings but, as compared with the pressure due to the angularity of the connecting rod, this is negligible.

According to a recent British paper on Diesel engines, cases have occurred with such engines in which the cylinder wear was greater in the plane of the crankshaft than at right angles thereto. This, of course, can happen only as a result of poor design or poor workmanship. There are two conditions which would result in excessive side wear. If the piston is not accurately at right angles to the crankshaft it will cock in the cylinder, which, of course, will give rise to excessive friction and wear. Secondly, if no adequate thrust bearing surfaces are provided on the crankshaft the end thrust may come on the pistons, where, owing to the higher speed, the wear is apt to be much greater than on the crankshaft thrust surfaces. In automobile practice the second cause is generally obviated by providing a generous clearance, usually of the order of $\frac{1}{8}$ in., between the connecting rod hub and the piston bosses.

There is hardly any need for insisting here upon the importance of correct alignment of the piston with the crank. Factory inspection methods fully cover this point and a poorly aligned engine is not likely to leave a modern plant.

ACCORDING to a note in a French paper, Poland is probably the one of all the civilized countries having the fewest automobiles. During the war the Russians during their retreat took along every car that seemed usable and later the Germans made requisitions. When the new Polish army was organized it had only a few automobiles which had been abandoned by the Germans. There is not a single taxicab in service in Warsaw, a city of more than a million inhabitants; gasoline is very difficult to procure and farm tractors are unknown.

Industrial Cities, Big and Little, Seek Better Housing Conditions

Business Proposal to Alleviate Unrest

Improved Home Conditions Designed to Check Progress of Radicals

Inadequate housing is admittedly one of the most potent causes for the wave of industrial unrest which has swept over the country. The problem is nation-wide, and in nearly every large city, as well as many smaller ones, constructive efforts are being made to solve it. Manufacturers themselves have been among the first to see the menace of the situation. Thousands of them are investing money in projects for the erection of more homes.

Better housing is being considered by business men chiefly as a business proposition rather than as a humanitarian move. It is believed that with more comfortable home conditions workers will be more contented and less easy prey for radical agitators preaching the rule of the proletariat.

AUTOMOTIVE INDUSTRIES presents herewith summaries from its correspondents of conditions in a score of cities, and means taken to ease the tension.

St. Louis Will Erect Low Price Dwellings

ST. LOUIS, April 24—A \$2,000,000 Home and Housing Association has broken ground for the first of the homes it will build for workingmen. This is St. Louis' way of meeting the housing problem, made greater by the building of the Buick and Chevrolet plants of the General Motors Co. and other industrial enterprises now being completed in what is known as the General Motors district at Union and Natural Bridge avenues.

More than \$1,000,000 of the stock has been subscribed by business men of St. Louis. The association will build 200 homes this year. The cost of the buildings will run from \$4,000 to \$6,000, depending on the location and number of rooms. Purchasers are required to pay 10 per cent of the purchase price of the home when the deed to the property is turned over to him, and then make monthly payments on the balance.

SPRINGFIELD SEEKS RELIEF

SPRINGFIELD, MASS., April 23—Attempts are being made here to form a \$1,000,000 home building corporation. The plan contemplated is for the manufacturers to subscribe half this amount and the other business men the remainder. The funds would be used to buy land and erect small single houses.

New York Proposes \$30,000,000 for Homes

NEW YORK, April 24—A proposal to build \$30,000,000 worth of homes which could be leased from New York City has met with favorable consideration of the members of the New York Board of Estimate. The proposal was made by Edward P. Doyle, chairman of the budget committee of the Real Estate Board of New York.

Doyle offers to start the undertaking on Staten Island, where he said there were available any number of lots that had come into the possession of the city through tax lien foreclosures.

Border Cities Building Thousand Residences

WINDSOR, April 23—One thousand homes of all sizes and prices will be erected in the border cities—Windsor, Walkerville, Sandwich and Ford City—this year, according to plans being formulated by the Border Chamber of Commerce, the city council and different manufacturers.

The actual cost will be about \$5,000,000, of which Windsor will provide \$2,000,000 for 500 houses, Walkerville \$1,500,000 for 300 houses, Ford City \$500,000 for 100 houses and Ojibway \$500,000 for 100 houses.

A company known as the Border Housing Co. has been formed, of which Hiram Walker of Walkerville is a member, and composed of officials of the larger manufacturing plants, members of the Chamber of Commerce and any one else who is interested in housing. The manufacturing plants will contribute to the building of houses according to their needs.

Major B. W. Vallat, general manager of the Dominion Forge & Stamping Co., one of the largest plants along the Essex border, also is behind the plan and says that his company will welcome any means to provide more houses for its employees.

All of the manufacturers are loath to go into the housing business themselves because of the experience of the General Motors Corp. and other large companies in like ventures in the United States.

WILL AID WORKERS

PITTSBURGH, April 19—Important industrial corporations in the Pittsburgh district are financing home building operations by their employees to relieve the house shortage in mill and mining communities. For the general public, trust companies have adopted similar plans.

Cleveland Business Men to Build Homes

Back Company Which Will Erect Homes for Workers on Easy Payments

CLEVELAND, April 24—Cleveland automobile manufacturers and employers of labor making automobile parts have been given the opportunity to invest in an employers' co-operative company that has been formed by the Cleveland Chamber of Commerce to relieve the housing shortage.

The co-operative company is known as the Cleveland Housing Co. The capital is \$1,000,000. Shares of stock sell at \$100 each. All stock is common and none of it is sold to workers for the reason that all of their funds are to be held to make the first payments on homes. From 10 to 15 per cent of the cost of a home will be accepted from the worker as first payment and the balance may be paid as rent.

The Willard Storage Battery Co. was one of the first concerns in Cleveland to invest in the company. The National Acme Co., which makes automobile parts, is another heavy investor. The Torben Axle Co., the Chandler Motor Car Co. and the Jordan Motor Car Co. have the proposition of investing under consideration.

Homes will be allotted workers in a factory in proportion to the amount of stock held in the company by the factory owners. The first homes of the housing company will be started within two weeks, according to Bainbridge Cowell, manager. It is proposed to build from 200 to 300 houses for workers this year.

The housing company was first suggested to serve as a financing corporation for workers who desired to own their own homes. Later it was found that the company should undertake the building of residences this year, on account of the acute shortage of suitable places in which to live. The shortage is 15,000 homes.

Cleveland automobile manufacturers look with favor on the movement, because they feel that the housing shortage is largely responsible for industrial unrest, and an unusually large labor turnover.

500 HOMES ARE NEEDED

GREENFIELD, MASS., April 22—With a population of less than 20,000, fully 500 houses are needed here. The Greenfield Home Corp., formed last January with a capital of \$250,000, has begun work on 100 dwellings, for which material has been obtained. These houses will be sold for 10 per cent down.

Stock Corporations Are Formed To Sell Workers Houses at Cost

Milwaukee To Sell on Installment Plan

Manufacturers Decide to Defer Plant Expansion Until Shelter Is Provided

MILWAUKEE, April 22—To obviate hindrance to the rapid but substantial development of Milwaukee as one of the greatest producing centers of the automotive parts industry in the United States, the new administration of the rejuvenated Milwaukee Association of Commerce has taken steps to relieve the acute housing shortage by the formation of a concern with a capital stock of \$1,500,000, financed by leading manufacturers and other employers, to build at once 100 dwellings as the start of an enormous home building enterprise.

Articles of incorporation were filed during the week in behalf of the Association of Commerce Housing Corp., the outgrowth of the work of the special committee on housing created when Walter C. Carlson took office as president of the association March 1. Officers of the housing corporation are: President, C. Raymond Messinger, of Sivy Steel Co. and Chain Belt Co.; first vice-president and manager, Martin J. Shenners, real estate; second vice-president, J. William Peterson, of Richardson-Phenix Co., makers of lubricators; secretary, M. R. Hunter; treasurer, E. J. Kearney, of Kearney & Trecker Co., makers of milling machines. The directors include Walter Davidson, president Harley-Davidson Motor Co.; Harold H. Seaman, of Seaman Body Corp., and other prominent manufacturers identified with the automotive industries.

Plans and specifications for types of houses to be constructed and sold virtually at cost have been prepared and bids are being taken for the construction of the first lot of 100 homes. The corporation will begin this week to accept requests for houses, which will be filled in the order of receipt.

The Garden Homes Co., a \$500,000 corporation, also has been organized by members of the city land commission, a quasi-municipal body, to build workmen's dwellings on an extensive scale. Several other large private home construction projects have been launched as well.

HOUSES CUT AS UNITS

DALLAS, TEX., April 20—About 200 public spirited men subscribed \$150,000 to establish the Dallas Housing Co. This body proposes to begin with 120 homes. To facilitate erection the largest saw mills in the Southwest have been employed to cut each house as a unit and deliver it on a car by itself.

Senate Committee to Study Home Needs

WASHINGTON, April 24—Senator Calder of New York has introduced a resolution providing for the appointment of a committee of five senators to inquire into the housing situation and report to the Senate not later than Dec. 1 on:

(a) The existing situation in relation to the general construction of houses, manufacturing establishments and buildings, and the effect thereof upon other industries and upon the public welfare; and

(b) Such measures as it may deem necessary to stimulate and encourage popular investment rather than spending, to foster private initiative in building and to insure co-operation between labor and persons or corporations engaged in transportation, banking, or other business necessary to the development of such construction.

Cincinnati Proposes Standardized Houses

CINCINNATI, April 24—Faced by a shortage of 4500 homes in Cincinnati, the Better Housing League, co-operating with Cincinnati manufacturers, is preparing to form a \$1,000,000 corporation to build homes to meet this shortage, without profit.

A thorough survey is being made now of the 60,000 industrial workers here to determine their exact needs and the type of house they are willing to buy, cash or time, or to rent. Homes will be built at minimum of cost in four standard types to meet desires of workmen, as shown by the survey, in the belief that this will do as much as anything else to relieve industrial unrest.

A new syndicate has purchased tracts of unimproved land with the announced intention of building salesrooms or buildings for firms seeking quarters. The first building will be one of the largest automobile salesrooms in the city, with 30,000 feet of space, for the Nash-Cincinnati Motors Co., wholesale and retail divisions.

POUGHKEEPSIE IS AWAKE

POUGHKEEPSIE, N. Y., April 24—Each manufacturer here who joined the housing corporation which has been formed paid in \$25 for each employee. The total raised in this way was \$400,000 and other business interests subscribed an equal amount. The fund is being used for second mortgage loans to any one who desires to build.

Indianapolis Strives to Meet Big Problem

Needs 10,000 New Houses to Shelter Rapidly Increasing Population

INDIANAPOLIS, April 24—Indianapolis is trying to meet its housing difficulty immediately and intelligently. The housing survey of the Indianapolis Chamber of Commerce showed conclusively that Indianapolis was in need of 10,000 new homes to take care of the population which, according to unofficial figures, is increasing at the rate of more than 100 daily.

The Chamber of Commerce is carrying on a drive for a larger Indianapolis industrially and is offering inducements for concerns to locate here, but is recognizing that if there is any pull to the appeal housing conditions must be met.

Rents are on the increase. Property is selling at extravagantly high prices, bought in many instances by tenants who either face purchase or eviction. The Chamber of Commerce says that these conditions make for social unrest, and, through its own forces, the banks, the building associations and the Real Estate Board, efforts are being made to build houses for the increasing population. There is much theory about the ideas. The only practical plans undertaken are those of the La Fayette Building Co., capitalized at \$1,000,000, half common and half preferred, financed by La Fayette Motors Co. interests and Indianapolis business men, and the Prest-O-Lite Co. plan of building homes for its employees near its plant to avoid the distressingly big labor turnover.

Mortgage Loan Plan Taken Up in Buffalo

BUFFALO, April 24—Though the housing problem is not believed to be as acute here as in other cities, and while the unrest evident in this city is attributed more to the excessive cost of food and clothing than to scarcity of shelter, the fact remains that Buffalo could use at the present time from 3500 to 4000 more houses than the city has.

Realizing this need, and foreseeing a more serious housing situation in the future, it being conservatively estimated that 40,000 workers will come to Buffalo to live within the coming year, Mayor George S. Buck has just appointed a committee of nine representative citizens, which, it is believed, will resolve itself into a second mortgage loan organization, which will make it possible for many to build homes inasmuch as they will also

(Continued on page 1042)

Ford Stores Cut Thousands From Employees' Living Costs

Sales of \$10,000 in One Day Represent Saving to Workers of
Approximately \$2,000—Ford Flour Mills
to Cut Costs Further

DETROIT, April 24—Cost of living for the 80,000 employees of the Ford Motor Co. has been materially reduced since the company established huge stores on Manchester Avenue, at which practically everything the workers need can be purchased at prices ranging from 20 per cent to 40 per cent less than those charged in the city shops. From underwear to overcoat and from shoes to top hat everything to outfit a man for his daily labor, for his semi-dress or for his banquet attire is to be found in the Ford store and at a price that is unheard of in the independent shops.

Henry Ford's latest venture is the construction of a huge flour mill at River Rouge, where the wheat raised on his own farm in sufficient quantity to feed all of his employees, is milled. Already sacks bearing the trademark "Ford Flour" are seen along the streets of Highland Park being carried or hauled to homes of residents.

Not only in the matter of clothing, food and shoes has he become active, but the establishment of a well equipped drug store, where drugs and druggist sundries may be found, is a part of the system. Then, too, the welfare efforts include a laundry, a hospital, a health and safety department, a dental office and laboratory, a motion picture studio, park and athletic field, bank and auditorium, educational and legal department, a home and rental exchange.

In the grocery store is included a meat market, where heretofore activities have been confined to the sale of bacon, hams and packed meats. A short time ago, however, plans were completed for handling fresh meats and to-day the white-aproned butchers in the Ford shop will serve the patron with a tender cut of roast or a loin of pork at from 10 to 20 cents less per pound than is possible to be secured in the city shops. The meat department is equipped with a refrigeration plant that is the last word in efficiency.

Comparison of prices in Ford and outside stores to-day show:

	FORD	OTHERS
Butter .....	.68	.87
Eggs (best) .....	.46	.60
Flour (1/2-bbl.)	1.65	2.10
Beans (10 lbs.) .....	.66	1.00
Cream Cheese .....	.33	.60
Drug Prices		
Peroxide (1 pt.) .....	.14	.75
Aspirin (per 100) .....	.16	1.25
Shoes		
Shoes and Oxfords	10.00	16.00
Meats		
Bacon .....	.35-.53	.55-.68
Lard (2 lbs.) .....	.60	.70

Ford's commercial activities started in December in what the manufacturer terms a "hole in the wall" in one corner of the plant, when he established a dry grocery. In a week it had proved so successful as to prompt him to branch out and the employees in charge of the

store were given carte-blanche to fit out the grocery to compare favorably with any in Detroit.

The plan went across big and one by one other branches were added. January 3 a tailor shop was installed in charge of two tailors, who had made a success of their individual business. The shop quickly proved as much of a success as the other ventures, the only handicap lying in the fact that the majority of employees objected to the delay necessary in having a suit made to order. This resulted in the determination to establish a ready-made store, which will be opened May 1 with a full line of clothing, hats and men's furnishings.

Some idea of the business being done may be grasped when it is stated that in the grocery, drug and clothing store on Saturday, April 10, the business totalled \$10,000, a saving of approximately \$2,000 to the employees. In the shoe store the sale of 250 pairs is considered a fair day's business.

The Ford stores are opened at 7 o'clock in the morning and remain open until 9 o'clock at night. This is for the purpose of giving employees of the three 8-hour shifts an opportunity to do their purchasing. Branches have been opened at the Dearborn tractor plant and also at River Rouge. The business in the main stores and the branches is increasing daily and the furnishing of additional store space will be continued as rapidly as buildings can be remodeled or reconstructed.

In the shoe store the employee or an outside individual may secure shoes for any service at prices ranging from \$2.79 for working shoes to \$10 for the stylish shoes that, as a rule, are found in the downtown stores selling for from \$14 to \$18. Thirty styles of shoes are included in the stock, and as evidence of their quality and style practically every official of the Ford Motor Co. is wearing shoes from the Ford stores, for which they paid from \$6 to \$10. The men find they wear and look like a million.

Separate Staff for Stores

Established with the view simply to help the employees cut living costs and lay by a little for the future, and not with the idea of competition or stifling trade in the independent stores, the venture has become so big as to require the entire time of at least two of the Ford executives. Under these men is a staff of employees, whose working conditions are the same as are maintained in the factory insofar as wages, salaries and bonuses are concerned.

A staff of buyers is kept on the road looking for bargains in the commodities needed in the Ford stores. Everything is bought in carload lots and paid for in cash, the cash discount adding materially to the price reduction to the consumer. Only a profit sufficient to cover the actual cost of handling is asked of the consumer.

Pending completion of the big flour mill at River Rouge, Ford has purchased a mill at Adrian, where he is grinding wheat from his farm.

One of the Ford Stores at a Shift Hour



Five clerks are shown issuing forth provisions under the eye of a store director. Looks like a run on the bank, but it has a directly opposite effect

Pan Motors to Sell \$2,000,000 in Stock

Minnesota Commission Authorizes Issue But Stipulates No Sales in That State

MINNEAPOLIS, April 24.—The Minnesota State Securities Commission will license the sale of \$2,000,000 worth of Pan Motor Co. stock when the company files an amendment adopted by the stockholders authorizing the issuance of the securities. It is stipulated that the cost of selling must not exceed 15 per cent of the sale price. The proceeds must be used for manufacturing and working capital.

The company is backed by responsible business men of St. Cloud. Samuel C. Pandolfo is barred from participating in the sale. Disposal of common stock in Minnesota has been prohibited. The security authorized is first preferred 8 per cent cumulative, participating, voting, at \$10 par, retireable at fixed periods in stated amounts after five years, at par.

Pandolfo, former president of the company, was sentenced by Federal Judge Landis in Chicago on Dec. 16 to serve ten years in prison for using the mails to defraud in the sale of stock. His attorneys appealed and he was released on bail pending determination of the appeal.

Conviction of Pandolfo marked the closing chapter in what was characterized by the authorities as an astounding advertising fraud. The national vigilance committee of the Associated Advertising Clubs of the World first called attention to Pandolfo's operations. It was alleged he received for his services as fiscal agent half of all the money subscribed for stock. A special appeal to holders of Liberty bonds resulted in nearly \$1,000,000 being paid in through them.

After Pandolfo's conviction the company was entirely reorganized and its affairs now are in the hands of reputable St. Cloud citizens.

BELGIAN GLASS IN PRODUCTION

NEW YORK, April 24.—The Belgian glass industry has so far recovered from the effects of the war, according to trade reports here, that eighteen ovens have gotten into operation, each turning out some 1,800,000 to 2,000,000 sq. ft. of glass monthly. Numerous orders are being refused, it is stated, and nearly nine-tenths of the output is being exported. Several additional ovens will be opened as soon as more coal becomes available, fuel apparently being the limiting factor in the glass production.

4256 FORDS MADE IN DAY

DETROIT, April 23.—Ford Motor Co. established a record for one day when on March 27 4256 cars and trucks left the factory. The nearest approach to this record was on a day in May, 1917, when 3868 cars and trucks were turned out. Of the total turned out March 27,

3756 were cars and 500 trucks. Up to the time the power ban was placed on the factory as the result of the strike, the company's production record, while never able again to reach that day's figure, hovered around the 3500 mark. Despite this enormous output, Detroit dealers and those in territory within 200 miles of this city have sold their allotments, and delivery of new Fords cannot be promised before fall.

Miller Employees to Get Summer Vacations

AKRON, April 24.—Non-salaried employees of the Miller Rubber Co., which employs 6,000 persons, will be given vacations this summer, the length of the rest period depending upon the term of service with the company. Employees on salary will continue to get vacations, but this granting of rest periods to non-salaried workers is an innovation.

Miller factory employees who have been in the employ of the company from two to three years will be given five working days' vacation. Those who have been three years or more with the company get 10 days off with pay. Vacation pay for day workers will be based upon the standard number of working hours per week at the average hourly rate. Piece workers' pay will be based upon the average piece work earnings per hour for one month preceding the vacation.

Tokyo to Assemble 300 Cars Monthly

NEW YORK, April 27.—Announcement was made here to-day that an assembling plant that will have a capacity of approximately 300 cars per month was in course of construction at Tokyo, Japan, by Sale & Frazar, the Japanese agents for Frazar & Co., of New York, which handles the Far East export for Ford, Hupmobile and Franklin passenger cars, Fordson tractors and White trucks. The new station will be in addition to that at present maintained at Yokohama, which will be continued. Shipments from this country to Japan have been assembled at Yokohama and driven overland to Tokyo.

N. A. C. C. AT GRAND CENTRAL

NEW YORK, April 24.—The National Automobile Chamber of Commerce moved this week to its temporary quarters on the fourth floor of the Grand Central Palace where it will remain about two months. When the Marlin-Rockwell building at Madison Avenue and Forty-sixth Street is completed, probably by July 1, the Chamber will be located there permanently. The organization functioned perfectly through the moving operations and did not slip a cog.

"TURMO," NEW ENGINE TITLE

DETROIT, April 24.—The trade name "Turmo" has been given by the Turner Moore Manufacturing Co. to its line of engines.

Deny Vanadium to Head Big Merger

Reports of Great Combination With Automobile Interests Discredited by Replogle

NEW YORK, April 22.—Reports that the Vanadium Corp. of America was to be the cornerstone of a great combination of automobile and allied companies were denied to-day by J. Leonard Replogle, president. The steel company is not for sale, he declared, although he said he had been approached recently by "two very large banks" with offers to buy. He declined to intimate the interests which the banks represented. It is not clear, therefore, whether they were acting for persons back of a great automobile merger of which many rumors have been heard of late.

Replogle said it was his desire to bring Vanadium steel to its highest point of development before he relinquishes the helm and that this development would take some time, for the corporation is still almost in its infancy. He added that it would be folly for the large owners of its stock to dispose of their holdings now when Federal taxes would consume a large part of the proceeds.

Reports have coupled the name of Allan A. Ryan with the merger said to be contemplated, but Replogle said Ryan owns a comparatively small interest in Vanadium. Charles M. Schwab, who has been associated in business with Ryan, is a large stockholder in the steel company, but Replogle's holdings are four times as large as those of any other individual, he said.

An effort to obtain a statement from Ryan in reference to the consolidation rumors was without avail. Various interests with which he is closely associated have been mentioned in connection with it. These include Stutz Motor Car Co. and Stromberg Carburetor as well as Vanadium.

Mine Railroad Nearly Ready

Replogle said he had received a cable message from Peru this week announcing that shipments of ore were larger this month than ever before in the history of the company. Rapid progress is being made by the Foundation Co. in building the railroad which will bring the ore down to Lake Punrun. The mines are 16,800 feet above sea level and the railroad will be 12 miles long.

It was explained by Replogle that when the railroad is completed there will be an immediate speeding up in shipments and this is expected in August or September. The ore now is transported down the mountain on the backs of llamas, the Andes beast of burden.

"What we are trying to do is to supply the automobile industry in this country," he said. "We are cutting down on shipments abroad and discouraging new uses for Vanadium at present. Domestic demand will be met first although we have heavy calls for our products from abroad."

Makers to Consider Dealer Advertising

Part to Be Assumed Will Be Discussed at Cleveland Meeting in May

NEW YORK, April 24.—The executive committee of the Advertising Managers' Council of the Motor and Accessory Manufacturers' Association has called a meeting of the entire council to be held at the Hotel Cleveland, Cleveland, May 7 and 8. Problems vitally affecting the automobile industry generally, as well as the individual members, will be discussed.

One of the central topics will be the manufacturers' advertising problems in relation to the dealer. It will be considered by S. E. Baldwin, advertising manager of the Willard Storage Battery Co., Cleveland, whose subject will be, "What Proportion of the Dealers' Advertising, If Any, Should the Manufacturer Pay?"

"The Part Advertising Has Played in the Development of the Automobile Industry" will be discussed by E. C. Tibbitts, advertising manager of the B. F. Goodrich Co. This paper will point out the need for closer co-operation between the car manufacturer and the parts and equipment makers.

WESTCOTT EXTENDS PLANT

SPRINGFIELD, O., April 24.—The Westcott Motor Car Co. has completed a new building at its plant 125 x 250 ft. in size, which will permit a greater output. The new structure is used as a warehouse and facilities thus provided will release for manufacturing purposes large sections of the main factory buildings which it has been necessary to use for storage purposes. Additional machinery and equipment have been installed, including a new set of electric ovens for the painting department.

MOTO-METER SUES STEARNS

NEW YORK, April 24.—The Moto-Meter Co., Inc., Long Island City, and Harrison H. Boyce have filed suit in Federal Court, Northern District of Ohio, against the F. B. Stearns Co. alleging infringement of the Moto-Meter patent, No. 1,275,654, filed in 1912. It is claimed the infringement is on a device called the Motor Eye. An injunction and damages are asked.

BUFFALO PROPOSES BOAT SHOW

BUFFALO, April 24.—There is talk here of arranging a permanent motor boat show at a centrally located point. Since the early days of motor boating Buffalo has been an important center. Many of the leading engine and accessory plants are located here, and recently a California engine manufacturer established its Eastern branch here.

The question of location for a permanent exhibition has been discussed, and many believe that the Associated Service

Building answers the requirements ideally. This is a comparatively new institution to provide display and sales space for manufacturers of all kinds of products. The building has 175,000 sq. ft. of floor space, now partly occupied by 400 manufacturers, and is a show place visited by hundreds daily. With a permanent showing of boats, builders believe a decided impetus would be given the industry.

Stutz Proposes Stock Increase of \$400,000

NEW YORK, April 26.—A call has been issued for a special meeting of stockholders of the Stutz Motor Car Co. of America, Inc., at the offices in this city on May 5 to vote on a proposal to increase the number of shares from 120,000 to 200,000, both without par value. They also will be asked to determine the additional amount of capital with which the business of the company will be conducted if the increase is authorized.

If this proposal is adopted, the shareholders will be asked furthermore to consent to the issuance of 80,000 additional shares at \$5 a share by the transfer of \$400,000 from the surplus to the capital account. These 80,000 shares are to be distributed as a stock dividend on a pro rata basis on the following dates, 20,000 shares on July 8, 1920, to stockholders of record June 15; the same amount on October 8, 1920, to holders of record September 15 and another 20,000 shares on Jan. 7, 1921, to holders of record December 15, 1920, and the final 20,000 shares on April 8 to holders of record March 15.

EAGLE BUYS STERLING PLANT

BROCKTON, April 24.—A large part of the plant of the Sterling Motor Car Co. is to be used now that the Eagle Motorcycle Co. of this city has been newly incorporated. Papers have just been filed at the State House. The capital is \$500,000 and the company is organized for the manufacture of motorcycles in Brockton. Ernest R. Smith of this city is one of the incorporators and is associated with Emanuel Kuhn and Benjamin Kaufman, both of Allston.

CLOSED CARS IN DEMAND

SYRACUSE, N. Y., April 24.—An unusually heavy demand for enclosed cars is shown by the present unfilled orders for 4042 on hand by the Franklin Automobile Co. More than half is for the sedan model. The present Franklin production is announced at 60 machines daily, with the schedule calling for 16,000 cars this year. The scheduled number next year is 25,000.

GRAY-DORT BUYS CAMPBELL

FLINT, MICH., April 24.—The Gray-Dort Co. of Chatham, Ont., has acquired the plant of the William Gray's Son-Campbell Co., Ltd., as an addition to the Canadian factory.

Would Eliminate "Factory" Missionary

Sales Manager Tells Jobbers to Reduce Distribution Cost by Sales Efforts

NEW YORK, April 26.—Elimination of the factory "missionary salesman" as a wasteful factor in the distribution of automotive equipment was advocated by W. S. Isherwood, sales manager of the Champion Ignition Co., in an address here to-day before the Eastern Automotive Equipment Association. Isherwood, whose remarks were seconded in a discussion participated in by several members of the association, declared that maintenance of the traveling factory salesman was a considerable tax upon the cost of distribution and that it resulted too often in selling the retailer the mechanical side of the goods instead of the opportunity for profit.

Contending that the missionary man had performed a certain service for the industry in bringing about marketing of products in territories which were underdeveloped from a merchandising standpoint, Isherwood asserted that jobbers should undertake more intensive efforts in developing retail organizations, particularly in the small towns. Jobbers, he said, must have salesmen who will not balk at covering the "bowl and pitcher" routes. Work along this line, he declared, would build jobbers' business in the way it should go and result in the withdrawal of the factory traveling man as unnecessary.

Jobbers who replied to Isherwood agreed with him regarding the wisdom of eliminating the missionary man at the earliest possible opportunity, but several were doubtful of the ability of jobbers, in view of accompanying profits, to go extensively into small town districts, particularly if manufacturers were to continue the policy of giving discounts to the larger retailers in such districts, these retailers in turn to pass on goods on a semi-jobbing basis to smaller dealers and garagemen. Almost unanimously they blamed the factory salesmen for a considerable percentage of returned goods sold for them by the factory man, stating that the latter too often tried to make a personal record in sales and overloaded the retailer.

Jobbers Need Efficiency Methods

Isherwood retorted that there was general need of greater jobber efficiency, pointing out that the missionary man largely was an instrument to go out and sell goods for the jobber who fails to do the work for himself, an agency to convince jobbers of their own merchandising opportunities.

John T. Galvin, president of the Metal Stamping Co., told the jobbers the shortage of bumpers was due to delays, through steel factory and freight conditions, in the receipt of materials.

The association, which is affiliated with the Automotive Equipment Association, has fifty-eight members.

Economy Assembly Gray Motors Plan

Branches in Ten Cities Will Put
Cars Together to Save
Freight

DETROIT, April 26—The Gray Motor Co. has been purchased by a syndicate of Detroit men and reorganized as the Gray Motor Corp. The stock of the new concern has been underwritten by New York and Chicago bankers. The present manufacturing units will be continued and new ones added by the corporation, which enters business with a cash capital of \$2,500,000.

The president and general manager of the Gray Motor Corp. is F. F. Beall, who has been vice-president of the Packard Motor Car Co. in charge of manufacturing for the past seven years. William H. Blackburn, superintendent of the Cadillac company for several years, is to be factory manager. The Benjamin Briscoe & Stahl Engineering Co. are the engineers.

The Gray Motor Corp. has made contracts with other parts manufacturers and in combination with these companies will produce all the major units for the new car which has been designed and developed by the Briscoe & Stahl company in the last year.

The business of the Gray corporation will be to finance, warehouse and manufacture all the component parts of a standard up-to-the-minute car, but it will be shipped in unassembled form to affiliated assembling companies at points best suited for economical distribution. There will be at least ten of these assembling and distributing companies in the United States and others will be established in the principal cities of the world. Companies are now being organized in Detroit and Chicago.

The Gray Motor Corp. also has obtained the manufacturing rights of the Briscoe, Storey & Stahl knocked down automobile body. It is believed that by shipping the parts of a moderate priced car in knocked-down form many traffic difficulties will be overcome and that there will be a large saving in freight charges.

418,000 HUBS IN MARCH

ALBION, MICH., April 16—Hayes Wheel Co.'s hub plant in this city rapidly is taking rank as one of the big industries of the state. The output during March was 418,000 hubs, an increase of 65,000 over production for the same month a year ago. The 1919 output at the local plant was in excess of 4,000,000 hubs.

FORM NEW TRUCK COMPANY

WALKERVILLE, ONT., April 24—Benjamin Gotfredson, president, and Frank J. Joyce, secretary and treasurer of the American Auto Trimming Co., have formed the Gotfredson-Joyce Corp., Ltd., to manufacture trucks. They have taken over the Gramm plant at Walker-

ville and are at present remodeling it, with the expectation of starting operations by about the end of April or the first week in May. The products of the factory for the present will be confined to 2½-ton trucks, of an approved model which has been in service and tested for the past six or eight months. The company expects to produce at least one thousand during the coming year.

Government Seeks Buyer for Airdrome

LONDON, April 10—(*Special Correspondence*)—The American Airdrome at Eastleigh, near Southampton, Hants, is for sale, and it is reported that the United States Government authorities are trying to interest Henry Ford in its suitability for a proposed Ford car works in England. The area is over 250 acres, and there are several large buildings ready for use, as well as stores and railroad facilities.

Before the war it was understood that Ford works would be built at Southampton, which is close to Eastleigh, but the scheme was set aside in favor of extensions of the Manchester Ford works. The latter as buildings do not compare with the war buildings now available, but had much to recommend them at the time Ford acquired them, on the score of size, cheapness and proximity to the Ship Canal at Manchester, with its facilities for direct transfer into store of parts shipped from Detroit.

The decision of the Ford company to build its cars and trucks almost wholly for the British and Colonial market in England, of course, has altered the outlook as regards the Manchester works and their suitability for the new program. It was stated awhile back that the Ford interests would spend \$5,000,000 on its English production scheme.

CURTISS RESUMES OPERATIONS

NEW YORK, April 24.—With the opening of the flying season, the Curtiss Aeroplane & Motor Corp. has resumed flying operations at Garden City, Buffalo and Atlantic City. The Curtiss school will be located at Garden City and will again be in charge of Richard H. Depew, Jr. Courses will be given in motor and plane construction and in repair and theoretical courses in elementary aerodynamics, cross country flying, instrument reading, etc.

BOSCH OFFERS RACE PRIZE

SPRINGFIELD, MASS., April 26.—The American Bosch Magneto Corp. will offer a cash prize of \$3,000 to the driver who wins first place in the 500-mile International Sweepstakes at Indianapolis on May 31. There will also be a second prize of \$500 and a third of \$250.

The only condition governing the awarding of the prizes is that the driver in each instance shall have used a Bosch magneto for ignition purposes. The purpose of the prizes is to focus attention upon the ignition question.

Sterling to Build 6-cylinder Knight

Stearns' Engineer Forms New
Company to Make Car in
Cleveland

CLEVELAND, April 24—J. G. Sterling for many years chief engineer of the F. B. Stearns Co., manufacturers of the Stearns-Knight motor car, has resigned his position with the Stearns company to head a company that will manufacture a 6-cylinder Knight motor car.

Sterling, who has associated with him P. H. Worthington and several well-known automobile men and capitalists in a temporary syndicate, has begun the development of the new motor. An adequate machine shop has been purchased in Cleveland for building the first experimental car and the new development is being pushed as rapidly as possible.

Sterling has secured his license to manufacture under the Knight patent. The plan for the financing of the new company has been worked out, the details of which will be announced soon. The company has secured a desirable site in Cleveland for its proposed new plant.

JOIN EQUIPMENT ASSOCIATION

CHICAGO, April 24.—Twelve manufacturing firms have been added to the list of members of the Automotive Equipment Association. The new members are: American Bureau of Engineering, Inc., Chicago; Alvord Reamer & Tool Co., Millersburg, Pa.; Apex Electric Manufacturing Co., Chicago; the Carborundum Co., Niagara Falls; Conant & Donelson, Conway, Mass.; Federal Brass Co., Chicago; Gill Manufacturing Co., Chicago; National Lamp Works of General Electric Co., Cleveland; Neville Steering Wheel & Mfg. Co., Detroit; Presto-Felt Mfg. Co., Toledo; Stewart Mfg. Corp., Chicago, and Stewart Mfg. Co., Oakland, Cal.

SPICER ACQUIRES SALISBURY

WORCESTER, April 24.—Control of the Salisbury Axle Co., one of the oldest manufacturers of axles for motor cars, has been acquired by the Spicer Manufacturing Corp. Spicer officials have contracted to purchase the entire 20,000 shares of common stock of the Salisbury company outstanding.

PIERCE RETAINS DIRECTORS

BUFFALO, April 24.—Directors of the Pierce-Arrow Motor Car Co. were re-elected at the annual meeting here. The vacancy caused by the death of Charles H. McCulloch, late president of the Lackawanna Steel Co. was not filled.

When asked if any action had been taken relative to the acquisition of the company by the General Motors Corp. the chairman of the meeting replied:

"Our answer to that is that we elected the old board of directors."

Wildman to Build Plant at Bay City

New Tire Company Will Have
Production of 7500 Tires
and Tubes Daily

DETROIT, April 22—Wildman Rubber Co., headed by W. W. Wildman, has been organized in Detroit and has taken over a tract of 60 acres in Bay City, where its \$2,500,000 plant is contemplated. The site for the new plant was given by the Board of Commerce of Bay City on the company's agreement to erect the first unit of its plant at an expenditure of \$1,000,000 within 18 months.

Wildman, who formerly was president of the Portage Rubber Co., and who formed that company as the outgrowth of the old United Rubber Co., said to-day the company would break ground for the Bay City factory within 90 days. A total of \$500,000 will be spent within the year, he said, and the agreed \$1,000,000 will have been invested in plant building and equipment within the 18 months specified. The company contemplates a production of 2500 tires and 5000 tubes a day, and the first unit will give employment to 1500 men.

With a capital of \$10,000,000 in 7 per cent preferred of the par value of \$100, and 100,000 shares of no par common, the company is placing on the market two shares of preferred and one of common for \$250. The company is incorporated under the Delaware laws, and the securities commissions of Michigan and Ohio have passed favorably on the stock issue. L. C. MacGregor, formerly Detroit branch manager for the Portage Rubber Co., and C. R. Twynham, for many years auditor and office manager of the Portage company, are officers of the new concern, the former vice-president and the latter secretary and

treasurer. A board of directors, including some of the big men in the automotive industry, is being formed.

Negotiations are now being completed for the purchase of a going tire concern at Akron by the new company, wherein the manufacture of tires and tubes will be started immediately.

Besides having been the founder and chief stockholder with his three brothers of the Portage, Wildman also was an organizer of the Federal Rubber Co.

Firestone Scholarship for Good Roads Essay

AKRON, April 24—High school pupils of the country will be given an opportunity to compete for a four years' university scholarship for the best essay submitted in connection with Ship-by-Truck—Good Roads Week, May 17-22. The awards will be made by judges appointed by the Federal Bureau of Education. The national prize will be known as the H. S. Firestone University Scholarship and the winner may select any university or college. In addition prizes will be awarded in each community. The essays must be kept within 500 words.

The purpose of the contest is to arouse interest in good roads and the feasibility of the motor truck as a short haul medium.

G. M. C. TRUCK STARTS PLANT

PONTIAC, MICH., April 24.—Work has been started on additions which will increase the capacity of the General Motors Truck Co., to 25,000 trucks in 1921. These additions will double the size of the plant, making it more than ten acres. Running along the south side of the property will be a railroad siding to facilitate the receipt of materials.

Colt Predicts Tires Will Supplant Rails

Business of \$1,200,000,000 This
Year Shows Trend, United
States Head Says

NEW BRUNSWICK, N. J., April 24.—A "startling increase" in the future for the tire business was predicted by Col. Samuel P. Colt, president of the United States Rubber Co., in his report to the stockholders at their annual meeting here to-day. In his statement he said:

"The business of all departments of your company is growing beyond precedent and your directors are striving in all ways through new construction and extensions to keep pace with its growth.

"Few perhaps realize the part being played by the automobile, the auto truck and the auto 'bus in the transportation of both passengers and freight. Forty trucks left last week to carry tire fabrics from the cotton mills in Rhode Island to the tire mills in the West. All of these vehicles are equipped with rubber tires, which to-day is one of the chief products of the United States Rubber Co.

"With the improvements in the highways of our country that are rapidly being made (as an illustration, the great Lincoln Highway) traffic will be moved more and more by rubber-shod vehicles, and less and less by cars and trains over fixed iron tracks.

"The tire business of the country in 1914 was \$300,000,000, and in 1920 it is estimated it will be \$1,200,000,000. Notwithstanding this phenomenal growth, I predict even a more startling increase in the future.

"We see, therefore, these conditions confronting us and shall strive our utmost to be prepared to cope with them."

George R. Geshner of New Brunswick was elected a director to succeed temporarily Theodore N. Vail.

S. A. E. TO HEAR HORINE

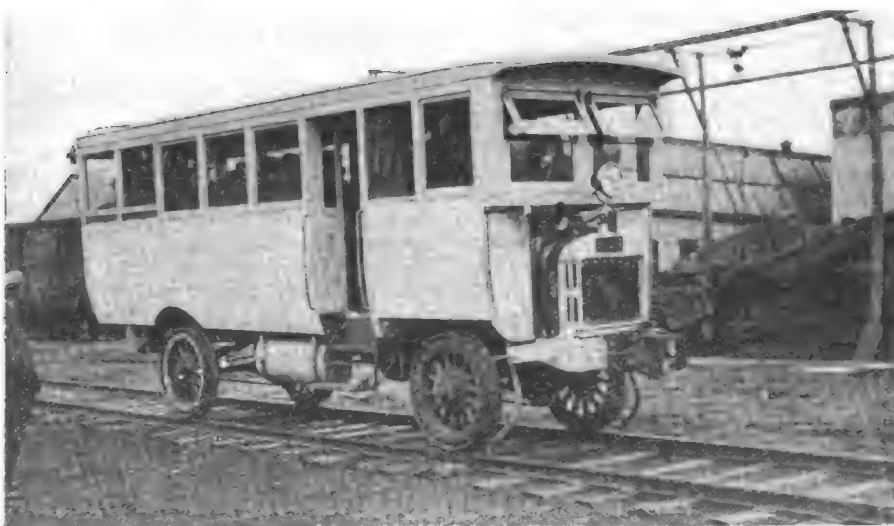
DETROIT, April 24.—Merrill C. Horine of the International Motor Co., formerly associate editor of Commercial Vehicle, will deliver a paper April 30 at the Detroit Section S. A. E. The subject of the paper will be, "A Study of Road Impact, Spring and Tire Deflection, etc." The studies are made by means of motion pictures and will be accompanied by a paper on the subject, taking up such matters as unsprung weight, spring suspension, tire deflection, etc.

JAPAN BUYS J. V. B. ENGINES

AKRON, April 24.—The Motor Boat Co. of Tokyo, Japan, has placed an order with the J. V. B. Engine Co. for twelve of Joseph Van Blerck's new four-cylinder 40-60-hp. marine engines.

These engines will be installed in stock boats which the boat company is building. The standardization idea as applied to motor boats is meeting with popular favor throughout the world.

Three-Ton Truck as Railroad Coach



This F W D truck equipped with flanged wheels and a passenger carrying body is being used on the Palatine, Lake Zurich & Wauconda railroad on its 16-mile route in Illinois. The truck has a capacity for 80 passengers and hauls a trailer carrying 5 tons of freight and baggage. Without the trailer the round trip, 32 miles, is made on 6 gallons of gasoline

Motor Trucks Rank With Rail and Water

Chamber of Commerce Gives Motors Equal Shipping Im- portance at Convention

ATLANTIC CITY, April 27.—Motor transportation, especially the truck, today was accorded a position equal to that of the railroad and the merchant marine in the Eighth Annual Meeting of the Chamber of Commerce of the United States. The introduction of the truck in this company took place in the general session on the subject "Transportation in Relation to Production." There were three subjects on the general program. George H. Graham, general sales manager of the Pierce-Arrow company, represented the truck, his subject being "Highways." He said in part:

"The advocates of highway traffic are proud to plead their cause from the same platform as their older brothers in transportation, the railways and the merchant marine. We have no thought to be their rivals. It is our aspiration to supplement them in the transportation trinity."

In reviewing the transportation situation Graham pointed out that the two established systems were overtaxed and the prospect of development was by a greater and more economical use of the highways. He called attention to the business complications brought on by the various transportation strikes and the aid rendered by the motor truck. Transportation must work equally with production.

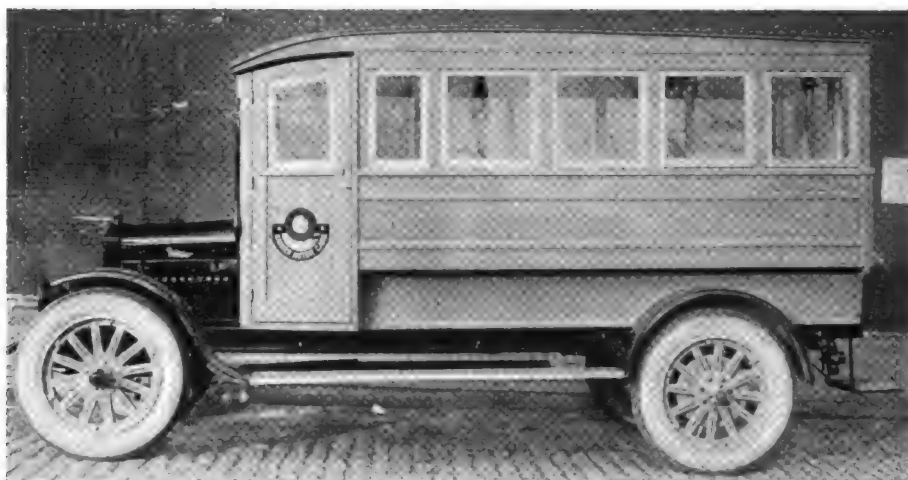
The passenger car had established itself and the truck is coming to that point, the greatest drawback so far being the failure to work it as a supplement to the railroads. Its future, he said, was as a feeder of steam transportation. The 3000 established rural motor express routes are proof of this value.

The other topics presented at the general session were: Railroads, by G. A. Post, president of the Standard Coupler Co.; Merchant Marine, presented by Admiral William L. Benson, B. F. Harris, a Chicago banker; Senator W. L. Jones of Washington, and John G. Pardee, president of the American Electric Railway Association.

In the group meeting, in the afternoon, the automotive speakers brought strongly to the attention of the assembled transportation men the utility of the motor truck in handling freight at terminals and for hauls shorter than those for which the freight car can be profitably used. Resolutions were adopted favoring national control of the highways.

WELDING SOCIETY MEETS

NEW YORK, April 26.—At the annual meeting of the American Welding Society, held April 22, plans were formed for closer co-operation with manufacturing companies to conduct extensive research work in the fields in which the society is interested. Officials of Baldwin Locomotive Works have offered their services in connection with the subject of



Omnibus to Be Used in Palestine

The streets of Jerusalem are soon to blossom forth with a fleet of buses to be operated there and between that city and Damascus in Syria by the Ramallah Company of Jerusalem and New York. The trucks are Rainiers with special bodies accommodating 25 passengers

boiler welding, and other companies have made similar offers touching various phases of the society's research activity. The point was emphasized that at present there is no adequate method of determining whether a weld is good or bad, and that welds made by some of the best experts sometimes break down without apparent reason. J. H. Deppeler, of the Metal and Thermit Corp., was elected president of the society for the coming year; Prof. Comfort A. Adams of Harvard retiring.

Christian Girl Buys Kalamazoo Company

DETROIT, April 26.—Christian Girl, former president of the Standard Parts Co., is heading a new company which has purchased the Kalamazoo Spring & Axle Co., Kalamazoo, Mich. The plant is to be remodeled and extended to manufacture automobile springs chiefly. Girl will be in direct charge of the new company.

Announcement of the purchase came as a surprise to Girl's friends in Detroit automotive circles. Details of the purchase are to be announced in a few days, but it is learned that Girl owns practically all of the stock in the acquiring company.

NO METRIC SYSTEM BILL

WASHINGTON, April 27.—The present Congress will not consider any bill to make the metric system of measurements compulsory in this country, according to a statement issued by Representative Vestal, chairman of the committee on coinage, weights and measures. This statement is made to clear up what appears to be a very general misunderstanding. Information has been given out that such a bill is pending and Vestal's committee is receiving many telegrams and letters on the subject, some favoring and others opposing such a move. Vestal asserts positively that no bill of this nature has been introduced.

Little Motor Heads Held for Conspiracy

Postal Authorities Allege Viola- tion of Mail Law and Plan to Defraud

DALLAS, TEX., April 26.—Charged with violation of the postal laws and with conspiracy to defraud, five officials of the Little Motor Car Co. of Grand Prairie, Tex., were arrested here and lodged in jail after their failure to produce a bond of \$25,000 each. Those arrested were William S. Livezey, president; R. L. McCoy, vice-president; George W. Stricker, secretary, and J. H. Crew and Herman Stricker, stockholders.

Soon after the arrests were made attorneys for the defendants filed habeas corpus proceedings for reduction of the bonds, which were granted. Livezey's bond was reduced to \$15,000, McCoy's to \$7,500 and the bonds of the three others to \$5,000 each.

Federal officials say that stock has been sold by the Little Motor Car Co., to the amount of \$1,000,000, to stockholders numbering 30,000. It is claimed that the assets of the company are less than \$300,000. The company, they say, was organized a year ago with a capital stock of \$100,000 which was later increased to \$1,000,000 and then to \$3,000,000. The stock originally sold at \$1 a share, but later was raised to \$4.

The company had built one unit of a factory at Grand Prairie, one office building and seven or eight frame buildings.

S. A. E. RESERVES QUARTERS

NEW YORK, April 24.—Hotel room reservations for the summer meeting of the Society of Automotive Engineers at Ottawa Beach now number 364. The fund to provide prizes for the athletic contests has reached substantial proportions, now standing at \$1,650.

Automobile Paper Banned by Bank

Kansas City Federal Reserve Acts Alone

Refuses Rediscount—Calls Passenger Cars Non-essential—Industry Aroused

KANSAS CITY, April 26—The Federal Reserve Bank of Kansas City has decreed that passenger automobile paper is undesirable for rediscounting. In less than a week it has declined approximately \$3,000,000 of this class of credit. In the same period, however, other Kansas City banks loaned in excess of \$1,000,000 to motor car dealers and distributors while the banks in the territory of which this city is the center loaned probably as much more. The contention of the Federal Reserve Bank is that a large proportion of the passenger car production is non-essential.

Trucks have not come under the ban and the Reserve bank has decreed that "any paper based solely on trucks is acceptable." The exclusive truck dealer can get credit when the one who deals both in passenger cars and commercial vehicles cannot. The latter must depend solely on his own banker and the attitude of the Reserve bank is finding reflection in other institutions. That is the chief menace of the situation. State banks not connected with the Federal Reserve system, which hitherto have taken automobile paper without question, are becoming afraid of it.

The position of the Federal Reserve bank was thus expressed by Carroll A. Worthington, deputy governor:

"A certain percentage of passenger cars are bought and used for pleasure purposes. If it were possible to discriminate in favor of cars to be used for utility, the bank would do so and rediscount paper on cars to be so used. But this cannot be done, obviously, since the dealer doesn't know what use is to be made of the cars he is receiving. We do know that the passenger car industry is using an enormous amount of money and man-power at a time when money and man-power are urgently needed for essentials—such use by the motor industry tending to increase wages because of withdrawal of man-power from other essential production.

Object to Maintenance Outlay

"We see right in Kansas City the enormous sums spent on motor cars—offering a definite objective for curtailment of spending. Some of this spending is essential, but we can't discriminate very well and so have to make the effort at curtailing the entire industry. There are 40,000 cars here and 30,000 of them perhaps are used for pleasure largely—an average maintenance of \$500 a year, or a total of \$15,000,000 a year."

A. B. Eisenhower, assistant cashier

of the National Bank of Commerce, who has kept in particularly close touch with the motor industry, said:

"Banks will continue to make loans on cars to dealers who have well established businesses and will protect their customers. But there will be curtailment. Fortunately, few cars are being received now, so that the issue is not well defined yet. But the next 30 days will probably show a marked decline in motor car business, unless a turn comes in the money situation. The most important effect of the Federal Reserve order is its moral effect on bankers, dealers, real estate men and the public. It seems to me that a mistaken impression is being created as to the utility of the motor car and that perhaps an unjust handicap may eventually be placed on the industry. This may partly be the fault of the industry itself and some of the elements involved in its financing."

(Continued on page 1037)

New York Banks Find Automobile Paper Good

NEW YORK, April 26—The Federal Reserve Bank of New York said to-day that it still was rediscounting automobile paper and expected to continue doing so. While every effort is being made to confine credit to essentials there is no intention, so far as known now, to discriminate against passenger cars.

At a time of the year when Western banks usually are in a position to send money to New York, the Federal Reserve banks of Chicago, Minneapolis, St. Louis and Kansas City are borrowing more than \$58,000,000 while New York and Boston are loaning more than \$72,000,000. The basic reason for this unusual situation is believed to be that Western farmers are holding their wheat and other crops and that the banks are finding it necessary to finance them. The result is a corresponding curtailment of credit to other lines of business.

The attention of the National Automobile Chamber of Commerce and the National Automobile Dealers Association already has been called to this new menace to the industry in the Kansas City district.

It was said at the N. A. C. C. that a vigorous protest would be filed with the Kansas City bank in behalf of the entire industry and that representations would be made at Washington if there was any danger of the idea of classifying passenger cars as luxuries becoming epidemic.

Harry G. Moock, executive secretary of the National Automobile Dealers Association, telegraphed that investigation in St. Louis did not develop a situation similar to that in Kansas City, but that his organization was taking up with the Federal Reserve Board in Washington the curtailment of credit.

Harding Says Stand Taken Not National

Each District Can Use Discretion in Deciding What Paper Most Essential

WASHINGTON, April 27—Action of the Kansas City Federal Reserve Bank in refusing to rediscount automobile paper and in characterizing the passenger car industry as largely non-essential does not reflect a national policy outlined by the Federal Reserve Board nor is it based upon any suggestion of the governing organization.

W. P. G. Harding, governor of the Reserve Board, told a representative of AUTOMOTIVE INDUSTRIES to-day that it is not the province of the board to determine the essentiality of an industry but merely the worth of its paper. He said, however, that it is proper for individual Federal banks to class certain paper as more or less essential in their districts. For example, he explained, farm paper would be more essential in Kansas and automobile paper in Detroit or Chicago.

The following statement on the subject was issued by the board:

"The Federal Reserve Board does not determine for the Federal Reserve Banks the desirability of any particular rediscount transactions so long as the banks conform to the provisions of section 13 of the Federal Reserve Act and the regulations of the board made in accordance therewith. The mere fact that a paper is technically eligible for rediscount does not impose any obligation upon a Federal Reserve Bank to rediscount it, for under the terms of section 13, no discount operation is mandatory.

Matter of Local Selection

"Under the provisions of section 4 the banks are required to show no partiality in the matter of extending loans and are directed to extend to each member bank such discounts, advancements and accommodations as may be safely and reasonably made with due regard for the claims and demands of other member banks. Thus it is obvious that a Federal Reserve Bank might, in its discretion, decline to discount for one of its members paper of the same class which it might take from another, or might in its discretion decline to discount any paper which it deems to be an undesirable asset.

"The board has no information as to the alleged action of the Federal Reserve Bank of Kansas City in declining to rediscount certain automobile paper, but assumes that if any such discounts were refused it was done in the exercise of that discretionary power necessarily conferred upon each Federal Reserve Bank. Since war restrictions were removed the Federal Reserve Board has not undertaken to distinguish between

(Continued on page 1037)

Peugeot Develops New Racing Models

Indianapolis Cars Now on Water
—Ballot Cars Delayed, but
Near Completion

PARIS, April 15—(*Special Correspondence*)—The track record for 500 miles will be broken at Indianapolis on May 31, declares André Boillot, who is to drive one of the three 183 cu. in. Peugeot cars just entered in that event. The record is at present held by De Palma with the Grand Prix Mercedes, which averaged 89.84 miles an hour in 1915. Boillot claims that the new Peugeot cars, although much smaller than the Mercedes built in 1914 are faster than the German production. The cars are lighter than those of a year ago and ought to be able to cover the distance with only one stop for tires and gasoline.

Boillot predicts that, with the keen competition this year, the more highly efficient engines and the lower weight and the better balance, the 500-mile record which has stood for five years will go by the board, with minutes to spare.

The Peugeot racing mounts are the finest looking machines ever produced by the racing department of the famous French firm. With a very low center of gravity, narrow radiator, staggered seats giving the minimum width, and complete streamlining, they give a wonderful impression of speed and stability. To get weight low down and to diminish head resistance, all the gasoline is carried alongside the propeller shaft. Front wheel brakes are used.

The engine is an entirely new production having four block cast cylinders measuring 80 x 149 mm. There are three camshafts and 20 valves for the four cylinders. Engine and gearbox form a unit attached directly to the frame members without the use of a sub-frame. The cars have been thoroughly tested on the road and are reported to be very fast and to have a remarkably quick pick-up. Boillot and Goux will leave for New York on the Lorraine April 17. Their three cars are being shipped on the same date by another steamer.

Syndicate Delayed Ballot

The French syndicate of automobile manufacturers is responsible for the delay in the completion of the Ballot cars prepared for the Indianapolis race.

"Last September," declares M. Ballot, "when I announced my intention of building racing cars, the French Syndicate of Automobile Manufacturers informed me that they did not wish any of their members to take part in racing during the year 1920. As I am not a member of this syndicate, for I only manufacture engines and not complete cars, I notified them that I did not attach any importance to their decision. Immediately I was informed that if I built racing cars I should be shut out of every show, exhibition or race held in France.

"In face of this threat I held back my program until the month of December, when the official French association of manufacturers informed me that the order against racing applied to home events and not to contests abroad. I got to work with the loss of three months, owing to this jealous attitude of the official body."

Every effort is being made to regain the lost time, but it is certain that the Ballot cars cannot be on the track until about one week before the race and consequently are likely to be at a disadvantage compared with other firms.

The Peugeot Racer



Says Action Is Not National

(Continued from page 1036)

credits for essentials and non-essentials and has issued no ruling based upon such a distinction. Nor has it made any suggestion to the Federal Reserve Banks that they should necessarily draw any distinction of that character.

"While the board has ruled that automobiles do not come within its definition of 'readily marketable staples' and are not therefore eligible as a basis for bank acceptances against warehouse receipts, nevertheless the board has distinctly called attention to the fact that this ruling does not preclude the rediscount of notes, the proceeds of which have been used to finance the purchase of automobiles, or the discount of acceptances secured by bills of lading covering automobiles in process of shipment provided that such notes and acceptances otherwise conform to the terms of the law and the regulations of the Federal Reserve Board."

CHICAGO CONTINUES LOANS

CHICAGO, April 27—Officers of the Chicago Federal Reserve Bank disclaimed to-day any knowledge of the action of the Kansas City Bank. It was said that since the armistice no effort had been made to differentiate between essential and non-essential industries. Paper of all kinds is treated strictly upon its merits.

Duesenberg Breaks More Speed Marks

Special 16-Cylinder Car Driven
by Milton Shows Tremendous Power

DAYTONA, FLA., April 27—Tommy Milton is busily engaged shattering world speed records at Daytona Beach in a special 16-cylinder Duesenberg car. He made a mile Saturday in 23.60 and two miles in 47.16, only to hang up new marks to-day when he covered the shorter distance in 23.07 and the two miles in 46.24. All his trials are being officially timed by Fred J. Wagner, representing the A. A. A. contest board. The previous records for these distances were made in a special Packard car by Ralph De Palma, who covered the mile in 24.02 and two miles in 49.54.

Milton wrecked the three, four and five-mile records Sunday. He covered three miles in 1.12.18; four miles in 1.26.4, and five miles in 2.00.04. Previous records, held by Ralph De Palma, were: One kilometer, 14.86; three miles, 1.15.04; four miles, 1.39.77, and five miles, 2.04.58. Milton also reduced his own world's record for the half-mile and the mile, doing the half in 11.86 and the mile in 23.56.

In the Duesenberg driven by Milton are two 8-cylinder engines placed side by side, each driving one rear wheel. The piston displacement is 583.8 cu. in.

Kansas City Bans Loans

(Continued from page 1036)

The dealers in Kansas City are awake to the perils in the situation and the board of directors of the Kansas City Association will take immediate action.

"The dealers must stand together on this," said W. J. Brace, president of the Hudson-Brace Motor Co., although it happens that his company is in position to go through the coming period without being hampered by the Federal Reserve action. "Whatever happens to any dealer, has an adverse effect on all dealers. It's no advantage, but an ultimate detriment to me to have the smaller dealer, not yet firmly established, get into trouble because of this action."

Bankers and dealers say frankly, that if the Federal Reserve ruling continues in force many dealers will be going out of business.

Motor securities company paper has never been re-discountable at the Federal Reserve banks, but this form of motor car financing is being affected quite as seriously as any other. One or two securities companies have gone out of business in the past year and several others are very sharply curtailing their operations.

"Banks and securities companies are discovering that motor car credits have been carelessly handled," said one banker. "The lack of careful credit work in the financing of car and truck purchases, was not particularly disastrous the past few years. But they can't get by now on slipshod credit methods."

France Prohibits Car Importation

Move Is Made to Re-establish
Industries and Stabilize
Exchange Rates

PARIS, April 26 (*Special Cable*)—The French government has decided to prohibit the importation of automobiles.

The foregoing cable, which was sent by W. F. Bradley, the European Correspondent of AUTOMOTIVE INDUSTRIES, at Paris, was the first notice of such action to reach New York, and it was received with great interest by automotive export firms. Previous rumors, through press dispatches, said France might declare an embargo on luxuries of all kinds in an effort to restore the exchange rate to a better figure. But representatives of the French government at New York, as well as Franco-American business organizations and exporters, were without information that automobiles had been classed in that category.

Attention was called by the National Automobile Chamber of Commerce to the fact that France had just increased the customs duties to 172 francs 50 centimes on automobile bodies weighing more than 2500 kilos, from 82 francs 50 centimes, and on bodies of less weight to 45 per cent ad valorem on the c.i.f. value at the port of entry. General customs on all automotive imports had been increased several months ago.

Shipments of American cars into France during the year 1919 totalled 866 cars valued at \$1,999,773, according to American official figures, while the truck exports numbered 3521 with a value of \$15,143,226. The figures for January and February of 1920, the last so far available, were:

	Cars.		Trucks	
	No.	Value.	No.	Value.
January	28	\$128,619	22	\$44,760
February	87	133,637	80	261,622

The embargo was viewed as a further step by France in her effort to re-establish her industries on the pre-war basis and to stabilize exchange. This, in the opinion of French financiers, would be made possible by a cessation of unnecessary expenditures outside the domestic borders. Luxuries—of which silks and similar textile products have been particularly mentioned—were estimated by French Minister of Commerce Isaac, to represent a yearly importation of some 1,300,000,000 francs. The rate of exchange on francs is quoted at 17.02, compared with the normal of 5.10.

GEMMER CAPITAL \$2,000,000

DETROIT, April 23.—Gemmer Manufacturing Co., Detroit gear manufacturers, has increased its capital from \$500,000 to \$2,000,000. Of the increase \$500,000 will be used in declaring a 100 per cent stock dividend at the annual meeting July 1. The remainder will be held as treasury stock and will be used in extensive expansion plans contemplated by the company.

The capacity of the plant has been utilized in the manufacture of steering gears for sixty customers numbering the leading automobile concerns, and with the greatly increased production schedule for 1921 in prospect, it became apparent the company would have to have more room to comply with this demand. In deciding on extensions to meet the increased automobile production demands the company decided to equip itself to care for new accounts.

Find Screw Products Mostly on Inch Basis

NEW YORK, April 26—The commission sent abroad last summer by the American Institute of Weights and Measures to investigate the possibilities of international standardization of screw products, estimates that 80 per cent of the screw products of the world are now made on the inch basis.

Inquiry in England disclosed a strong sentiment among industrial leaders against abandoning their established system of weights and measures. It was learned that the Sideley-Deasley Co., large automobile manufacturers at Coventry, had started on the metric system when they took over certain foreign types of machines but have since changed over and are working entirely under the British system.

Sir Auckland Geddes, recently appointed British ambassador to the United States, declared himself against the metric system when he was president of the British Board of Trade.

Sterling Reduces Tire Price Scale

NEW YORK, April 26—The Sterling Tire Corp., Rutherford, N. J., has reduced prices on several sizes, the decrease ranging from \$2 on some sizes to \$10 on others. Its 30 x 3½ fabric shows a decrease from \$36 to \$26.60.

The following comparative list shows the sizes affected by its April 10 prices:

Size	Jan. 1, 1920.	April 10, 1920.
	Fab. Cord.	Fab. Cord.
30x3	25.00	22.00
30x3½	36.00	26.60
32x3½	40.00	35.00
31x4	41.00	36.00
32x4	60.00	56.55
33x4	62.00	58.00
34x4	63.00	59.60
32x4½	68.00	63.70
33x4½	67.00	65.35
34x4½	70.00	66.00
35x4½	71.00	67.00
36x4½	72.00	68.00
33x5	85.00	79.65
35x5	83.00	80.00
37x5	87.00	85.00
36x6	130.00	119.35

NEW GENERAL TRACTOR HEAD

NEW YORK, April 27—At a meeting here of the directors of General Tractors, Inc., of Chicago, Russell S. Tucker was elected president and treasurer to succeed W. N. Smith who will continue as president of the Monarch Tractor Co. of Watertown, Wis., and Monarch Tractors, Ltd., of Brantford, Ont. General Tractors is the holding company operating plants at Watertown, Paulsboro, N. J., and Brantford.

Ford to Reorganize, Stock \$100,000,000

Corporation Will Combine Two
Companies and Add Aircraft
and Street Cars

LANSING, MICH., April 27—Henry Ford and his family will reorganize their interests by the formation of a new corporation in Delaware which will have a capital of \$100,000,000. Formal notice of the step intended was contained in an application filed with the secretary of state here to-day for permission to do business in this state.

The new company will be authorized to manufacture aircraft, internal combustion engines and railroad cars as well as automobiles, trucks and tractors. It will be chartered in Delaware because the laws of Michigan do not permit any company to have a capital of more than \$50,000,000. It is understood that all the capital stock will be held by Mr. and Mrs. Henry Ford and Edsel Ford.

The purposes of the new company caused no surprise for it has been known for some time the Fords intended to enter the aircraft field. There have been many rumors about their purposes along this line but no authoritative statement. They also have developed a gasoline-driven street car which is designed to lower materially the costs of operation.

Formation of the \$100,000,000 corporation will be by consolidation of two companies having a total capital of only \$3,000,000. The present capital of the Ford Motor Co. is \$2,000,000, while that of the Henry Ford & Son Corp., formed originally to make tractors, is \$1,000,000.

COMPRESSION TUBE TO BUILD

PITTSBURGH, April 24—Plans are being made by the United States Compression Inner Tube Co., a corporation of Tulsa, Okla., to build a puncture-proof inner tube factory in Pittsburgh or its immediate vicinity. H. B. Eyer, representative of the corporation, has opened offices in the Wabash Building. In recommending a site for approval of the company's officials and preparing for distribution of the tubes, Eyer will be assisted by W. H. Lessig and J. H. Blake of Tulsa.

The Tulsa factory will have a production of 4,000 tubes and 1,000 casings daily when the maximum capacity is attained, and Eyer says the Pennsylvania plant will be a replica of the Tulsa factory.

Patents for the tube have been granted in the United States, Argentina, Australia, Brazil, Great Britain, France, Italy, Mexico, Spain, Denmark and Canada. Patents are pending and are expected to be issued in Belgium, Cuba, Holland, Russia, Sweden and Switzerland.

The plant here will be the third unit of the organization. Plans have been made for extensive production.

INDUSTRIAL NOTES

Black & Decker Mfg. Co., Baltimore, has opened a northwestern branch office at 169 Massachusetts Avenue, Boston, which will be in charge of D. G. Caywood. A service station will be maintained in the same building.

Vacuum Muffler Corp. has moved its general offices in New York from 154 Nassau Street to 68 Broad Street.

Monroe Steel Castings Co., Monroe, Mich., has been purchased by a syndicate headed by A. Von Eschen, superintendent of the Michigan Steel Castings Co., Detroit, and C. F. Clark.

Superior Auto Radiator Works has been organized at Newark, N. J., to manufacture automobile radiators and similar metal specialties.

Haynes Automobile Co. has been delayed in the completion of its new factory for the manufacture of baby Haynes by the difficulty in transporting building materials. The plant is designed to meet the demand for lighter cars.

Emerson-Brantingham Implement Co., Rockford, Ill., has opened a permanent exhibit of tractors and other farm machinery at Grand Central Palace, New York.

Frisbie Motor Co., Middletown, Conn., announces an increase in the price of Frisbie valve-in-head marine motors. This is the first advance in prices made by the company in two years.

Evinrude Motor Co., Milwaukee, has announced price increases of about ten per cent in its outboard and inboard type of marine motors.

Aluminum Manufacturers, Inc., successors to the Aluminum Castings Co., has decided to establish its eastern sales office at its Fairfield, Conn., plant. Except for permanent mold castings practically all orders and estimates for the eastern district are executed at this plant.

Electric Storage Battery Co. has removed its New York office from 100 Broadway, where it had been for twenty-two years, to the National Association Building, 23 West Forty-third Street.

Hall Motor & Machine Co., Hannibal, Mo., has changed its name to Hall Battery Co. and will give up all automobile work because of the increase in its battery business.

Northwind Spark Plug Corp. has been formed to take over production of the Northwind spark plug on a commercial scale and has established a plant at Union Hill, N. J.

WHEELLESS TRAILER ON MARKET

STANLEY, WIS., April 26.—The Wheelless Trailer Co. of Stanley, Wis., has been organized with a capital stock of \$25,000 and will manufacture a new type of trailer, designed by O. W. Henderson, who has been building it on a limited scale for several months. An existing building has been acquired and will be remodeled and re-equipped. The

Wheelless trailer has the appearance of a rack quickly attached or detached from the rear of a passenger car or truck. It consists of two beams which rest on the rear axle, the front ends being attached to the frame a few feet in front of the axle. Across the ends of the beams extending behind the car there is a box or rack, spring supported, to carry about 500 lbs. of additional freight, such as milk cans, trunks, bags or other luggage.

Franklin to Increase
Stock to \$40,000,000

SYRACUSE, N. Y., April 27.—A special meeting of the stockholders of the H. H. Franklin Mfg. Co. has been called to vote on a proposal to increase the capital from \$7,000,000 to \$40,000,000 which already has been approved by the directors. It is proposed to increase the preferred from \$5,000,000 to \$15,000,000 and the common from \$2,000,000 to \$25,000,000. Details of plans for future expansion in addition to those already under way have not been disclosed.

The industry now is the largest in Syracuse with 5000 employees and this number will be increased by 1000 within a year. The manufacture of 1-ton trucks, in which the experimental work is almost completed, will be carried on by a separate corporation with which the new financing has nothing to do. Present production schedules call for 63 complete passenger cars a day and this number will be raised to 81 a day.

AUSTIN PRICES ADVANCE

LONDON, April 10 (*Special Correspondence*)—Considered in terms of various commodities, money is cheap today. Thus, for instance, the "Austin Twenty" car, which was once expected to be equivalent of £495, is now priced at £695, a further advance of £100 having been found necessary.

The new prices affect all cars not yet delivered. They are as follows:

"Austin Twenty" touring car....	£695
Coupe	850
Landulet	875
Chassis only.....	550

The Austin farm tractor will in future be sold at £360.

START DIXIE HIGHWAY LINK

CHATTANOOGA, Tenn., April 24.—Steps have been taken to start work at once on the last section of the Jacksonville-Waycross link in the Dixie highway. Work is already under way on the mountain sections between Nashville and Chattanooga, on the western division and on the eastern division between Cincinnati and Knoxville.

RECORD COTTON PRICES

PHOENIX, ARIZ., April 24.—All previous high prices for long staple cotton, used in manufacture of thread and of fabric for motor car tires, are believed by local dealers to have been broken here when cotton companies announced purchase of 33 bales at \$1.25 per pound.

METAL MARKETS

Pig Iron—Although several large-sized transactions in which merchant furnaces were the sellers, have come to light, very little business for delivery in the last half of the year has so far been consummated. With foundry iron selling at around \$45 many consumers can see no reason for undue speed in placing orders. It is becoming apparent, however, that there is a large suppressed demand and, if this should manifest itself simultaneously, runaway conditions are possible.

Iron and Steel—With the improvement in transportation conditions, mills are beginning to quicken production although it will be some time before they are back to the rate of output that prevailed before the strike tied things up. The larger independent producers have not yet formally opened their order books for third quarter deliveries, although some sales to particularly large customers are reported to have been made. In such business as has been placed for automobile sheets, prices are said to be about 2 cents a pound above the levels fixed last year by the Industrial Board and which scale of prices continues to be faithfully adhered to by the leading interest. The placing of large orders for ferro-alloys that enter chiefly into steels used for automotive purposes, reflects a strong demand from that quarter.

Aluminum—The market continues firm with the sole American producer's quotation for 98 to 99 per cent pure virgin ingots remaining at 33 cents. Gossip continues that some foreign or resale metal can be had at lower figures but buyers who have scoured the market, report that they find invariably a fly in the ointment of such offers.

Copper—Large consumers are supplied until July and are sitting back serenely awaiting developments. Producers say that, when these consumers enter the market, advances are certain to ensue. On the other hand, resale interests contend that this will merely help to clean up part of the surplus now in dealers' hands. Casting copper has been in better demand of late than either lake or electrolytic.

Tin—Amid seesaw conditions resulting from continuing speculation in the foreign markets and the ups and downs of exchange, the market for Straits receded in the week between April 15 and April 22, more than 5 per cent No. 1 Chinese has been sold at 60 cents.

Lead—Much lead has been sold for third quarter delivery at 8.25 and 8.35 cents, East St. Louis basis. Some Mexican lead is being offered.

Zinc—The zinc market is in the doldrums, the chief cause being the lack of export demand.

Brass—The labor situation in the Connecticut Valley brass mills continues to impede output and the falling off in production is a source of serious inconvenience to many consumers.

Automotive Financial Notes

Rainier Motor Corp.—President Rainier reports that based on present producing capacity net earnings for year should not be less than \$1,000,000. Godfried Piel, president of Piel Bros., has been added to directorate.

Martin-Parry Corp.—Declared usual quarterly dividend of fifty cents a share. Sales for first quarter amounted to \$1,149,000 compared with \$700,000 in first three months of last year.

Middle States Rubber Co.—Capital increased to \$2,000,000 and will manufacture tires in addition to tubes.

Kennedy Corp., Baltimore.—Organized with \$2,000,000 capital to make cylinders, gear cases and other parts for various types of automobiles. Will build plant on 4½ acre site on waterfront with four open-hearth melting furnaces and seven annealing furnaces.

Bacon Motors Corp., New Castle, Pa.—Will capitalize at \$2,000,000 to make passenger cars. One factory unit has begun production and two others are planned.

Commercial Truck Co. of America, Philadelphia.—Capital increased to \$4,000,000 of which \$1,000,000 has been paid in. Extensions proposed to increase output fivefold.

Federal Motor Truck Co.—Declared stock dividend of 100 per cent payable May 1. Cash dividends paid to April 1 were twelve per cent.

Stromberg Carburetor Co.—Annual report shows net profits after charges and Federal taxes of \$401,328 or \$5.34 a share on 75,000 shares of capital stock of no par value.

Timken-Detroit Axle Co.—New \$10 common stock sold high at \$63.25 on its first day on the local exchange, after par was reduced from \$100. These figures compare with \$575 bid and \$580 asked for the old stock last week.

Benton Harbor Forging Co., Benton Harbor, capitalized at \$200,000, to manufacture forgings and castings. Fred A. Fuller is president.

Jamcap Rim Tool Corp.—Incorporated at Boston for \$250,000 to manufacture automobile equipment.

Maibohm Motors Co.—Reports net earnings at the annual rate of forty-eight per cent for first quarter of 1920. Net business showed an increase of sixty-eight per cent over previous quarter.

Hamilton Motors Co., Grand Haven, Mich.—Capital increased from \$500,000 to \$1,500,000, proceeds to be used in enlarging factory for increased production of Apex line of commercial vehicles. Adolf Pricken, connected with shipping and warehouse operations in New York, has been elected president.

Miller Rubber Co.—Reports sales for March aggregating \$3,600,000.

Meyer-Kiser Corp.—Capitalized for \$1,500,000 at Indianapolis for automobile funding and general business in buying and selling commercial paper.

Stewart-Warner Speedometer Corp.—Declared regular quarterly dividend of \$1 per share.

Tiger Cord Tire & Rubber Co., Akron.—Incorporated with capital of \$2,000,000 to manufacture tires and tubes. Proposes erection of factory at once.

Motor Wheel Declares Initial Dividends

LANSING, MICH., April 26—Motor Wheel Corp. directors at the April meeting last week declared a 50 per cent stock dividend from surplus earnings, and a 2½ per cent cash dividend on common stock. The cash dividend is payable May 20 to stockholders May 10, and stock dividend is payable June 1 to stockholders May 15.

The dividend action is the first since the merger of Prudden Wheel Co., Auto Wheel Co., Weis & Lesh Mfg. Co. and the Gier Pressed Steel Co. The sales department reported at the meeting sufficient orders on the books to require full time operation for the next 10 months. The directors reported that a rearrangement of the executive departments and development of the reorganization plan is progressing rapidly. Most of the old stock of the different companies has been transferred. The dividends declared apply only to the new stock.

Elgin Motors to Pay 5 Per Cent for Quarter

CHICAGO, April 24—The Elgin Motor Car Co. has decided to pay a 5 per cent cash dividend out of the earnings for the first quarter of 1920 and if strikes or other abnormal conditions do not interfere other cash disbursements will be paid during the year. An extra stock dividend also is probable in the near future for the stockholders have authorized an increase in the capitalization from \$3,500,000 to \$10,000,000.

C. S. Rieman, president and general manager, reported a steady increase in the volume of business and showed that in the month of March the company built and sold more than \$1,000,000 worth of automobiles. Net profits for that month, the report showed, were at the annual rate of 52 per cent on the outstanding stock while the rate for the quarter was 37 per cent.

CHANDLER TO VOTE DIVIDEND

NEW YORK, April 26—A meeting of the directors of the Chandler Motor Car Co. has been called for May 5 to consider action on a stock dividend. There are reports, which it has been impossible to confirm, that the disbursement may be as large as 33 1-3 per cent. Action will be taken in June on the quarterly cash dividend.

Earnings in the first quarter of this year are officially estimated at \$2,500,000 or at the rate of \$10,000,000 annually before taxes. This would be equivalent to almost \$48 a share on the present capitalization of 210,000 shares and better than \$35 a share on a basis of 285,000 shares outstanding if a stock dividend of 33 1-3 per cent is declared.

In the three months ended March 31, 1920, 7,373 cars were shipped. For the week ended April 12, 544 cars left the factory and despite the railroad strike production is being maintained at a high pitch.

Bank Credits

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

The Kansas City Federal Reserve Bank will make a specific effort to curtail the passenger automobile industry as being, in its opinion, partly a non-essential industry. This move is in connection with the initiative that the Kansas City bank has taken in exercising the power to fix lines of credit to member banks under the recent act passed by Congress.

It would not seem that the Kansas City plan could be adopted in New York, so long as the New York Reserve Bank is lending money to other Reserve banks. It would hardly be fair to New York business. The New York Reserve Bank last Saturday was lending approximately \$64,000,000 to other Reserve banks, a gain for the week of \$27,500,000. In spite of this and of exports of gold, it gained \$32,000,000 in gold reserves, at the expense of Western and Southern banks. The system as a whole lost \$4,000,000 in gold.

It is impossible to say how far domestic gold movements are due to commercial influences and how far to government financing. In the New York Clearing House Bank's weekly statement, loans declined \$72,000,000 following an increase of \$77,000,000 the preceding week. Excess reserves rose by nearly \$12,000,000. Stock exchange liquidation doubtless had some part in the loan decrease.

The general credit situation remains essentially unchanged, with the probability that interest rates will continue at present levels.

HUPP STOCK SHOWS STRENGTH

NEW YORK, April 27—Recent strength on the Stock Exchange of the stock of the Hupp Motor Car Corp. is attributed to its largely increased earnings. It is expected the net profits for the fiscal year ending June 30 will exceed \$3,000,000 after all charges and Federal taxes. After preferred dividend requirements this balance would equal more than \$5.50 a share on the common outstanding. The net profits last year were \$535,602. The estimated production of cars for this year is 22,000 as compared with 17,442 last year.

Men of the Industry

Ralph S. Allen, recently elected vice-president of the Duratex Co., Newark, N. J., is general manager of the company as well.

H. J. Crean, assistant secretary-treasurer of Fisher-Walker, Ltd., Sandwich, Ontario, has been appointed assistant to the president of the Collier Motor Truck Co., Bellevue, Ohio.

F. A. Rendon has been appointed export manager of the International India Rubber Corp., South Bend.

L. M. Baker has resigned as supervisor of sales of the motor equipment division of the Hyatt Roller Bearing Co. to take over the exclusive representation of the Dittmer Gear & Mfg. Co. in Michigan, with offices in Detroit.

Karl M. Wise of Detroit has been appointed consulting metallurgist of the Russel Motor Axle Co.

George S. Shugart, general sales manager of the United States Tire Co., has been named vice-president of the company.

Morgan Harding, Detroit sales manager of the Aluminum Manufacturers, Inc., has resigned. Harding has become interested in the Co-Statley Manufacturing Co. of West Haven, Conn., as sales manager. He will be succeeded by L. T. Youngs, manager of Michigan sales for the Aluminum Co. of America.

H. W. Zimmerman of the Cadillac Tool Co. of Detroit, has organized a company at Milan, Mich., to manufacture tools. M. H. Hack is president and Allan Johnson, secretary and treasurer.

David H. Chreider, president of the Michigan Metal Supply Co., has sold his interest in the company to E. M. Welker, who has been elected president. A. M. Welker has been elected vice-president and M. A. Morgner, secretary-treasurer.

Frederick I. Lackens, former secretary of the Toledo Commercial Club, has been appointed advertising manager of the Allen Motor Co. at Columbus, Ohio.

L. J. Seebach, who has been managing the Brooklyn branch of the Willys-Overland Co., has been made manager of the New York branch succeeding George E. Smith, who recently became retail manager for Guy O. Simons in Detroit.

Guy DeLong, former chief of Maxwell Motor Co.'s school for motor mechanics, has returned to Detroit from Haiti, where he has been supervising service for Joseph Murad & Son, Maxwell distributors.

H. W. Usherwood has been appointed assistant to Harry S. Daniels, advertising manager of the Dort Motor Car Co., at Flint.

E. W. Kronbach has severed his connection with the Aluminum Manufacturers, Inc., at Cleveland. No successor has been named and Kronbach has not announced his future plans, but for the present he is at 1195 East 125th Street, Cleveland.

J. P. Brennan, former state treasurer of Ohio has assumed his duties as secretary of the Columbus Tire & Rubber Co.

Archibald Black, formerly of the Navy Department, and his brother, Donald R. Black, have opened an office in the Evening Star building, Washington, as consulting engineers on airplane and light motor vehicle problems.

G. J. Eyler has been appointed sales promotion manager of the Service Motor Truck Co., Wabash, Ind.

Paris Correspondent to Study Industry Here

NEW YORK, April 28—W. F. Bradley, Paris correspondent of AUTOMOTIVE INDUSTRIES and the other Class Journal papers, will arrive in New York about May 8. He will spend several weeks in automotive circles in the United States and will witness the Indianapolis race. His visit is for the purpose of gaining first-hand information of the industry that he may better interpret Continental developments and trends for the readers of Class Journal papers.

Taylor Society to Discuss Management

NEW YORK, April 26—The Taylor Society, national organization for the promotion of scientific management in industry, will hold a three days' conference in Rochester, N. Y., on May 6, 7, and 8. The meeting will be under the auspices of the Industrial Management Council and the Manufacturers' Council of the Rochester Chamber of Commerce. A number of prominent manufacturers, industrial engineers, and labor authorities will speak and participate in the round-table conferences which are to be held outside of the regular sessions.

Ernest Martin Hopkins, president of Dartmouth College, Dr. Meyer Jacobson, labor manager of the Stein-Bloch Co., Dr. William Leiserson, chairman of the Labor Adjustment Board, Rochester Clothing Industry, and Frank M. Gilbreth will be among the speakers.

Too Many Press Agents, Says Publishers' Group

NEW YORK, April 24—Much of the time of the American Newspaper Publishers' Association was devoted at its convention here this week to discussion of the question of free publicity. Members contended that the enormous increase in the number of press agents, together with the acute shortage of print paper, made the problem more pressing.

Some publishers contended all press agent mail should be consigned to the waste basket before it reached editors' desks while others held that the amount of space given sporting events should be sharply curtailed. Opponents of the present sporting page policy asserted that when such affairs were held for profit the promoters should be compelled to pay for the space they get. A few went so far as to hold the ban should apply to professional baseball.

There also was criticism of free publicity for automobiles, moving pictures and books. The arguments presented covered a wide range and it was evident the publicity man had few friends on the floor of the convention.

ZIMMER JOINS DUPONT

WILMINGTON, DEL., April 26.—R. A. Zimmer has joined Dupont Motors, Inc., as chief engineer and will be in charge of engineering on the new Dupont automobile, which will be brought out about June 1. He was associated as designer with the Crane Motor Car Co. as long ago as 1904, and more recently has served as designing engineer with the Simplex Automobile Co. and the Wright-Martin Aeronautical Motors Co. Zimmer will succeed John A. Pierson of Metuchen, N. J., who recently resigned as chief engineer for the Dupont company.

SPOONER LEAVES FREE PRESS

DETROIT, April 23.—F. Ed. Spooner, for eleven years editor of the *Automotive World* column on the Detroit Free Press, has resigned to devote his attention to other interests. Spooner is widely known in the automotive industry, having graduated from the old bicycle squad and having been among those present at every automobile racing event and national show since the industry had its birth. Pressure of other business, including his publicity bureau in Detroit, and his connection with Motor West, published on the Pacific Coast, compelled him to relinquish his post with the Free Press.

MORRISON GIVEN SEND-OFF

SPRINGFIELD, MASS., April 24.—Andrew J. Morrison, known to his colleagues as "Andy," who May 1 goes with the International Motor Truck Co. as engineer of works, was given a send-off to-day at the plant of the J. Stevens Arms Co., Chicopee Falls, where he has occupied a similar position.

EUROPEAN AIR LINES START

NEW YORK, April 24.—Information concerning the formation of two new commercial air lines in Europe within the last few weeks has been received here. One of these, in Spain, was inaugurated on April 1 as the first aerial postal service in that country. The mail will be carried between Barcelona, Alicante and Malaga on the Frejus-Toulouse-Rabat line. The second is a plan for a postal service between the Netherlands and England.

Calendar

May 17-22 — Ship-by-Truck — Good Roads Week — May 17-22

SHOWS

Oct. 6-16—New York. Electrical Show. Grand Central Palace. George F. Parker, Manager.
Dec. 10-18—New York. Motor Boat Show. Grand Central Palace.

FOREIGN SHOWS

May 15-June 13—Cars, Parts and Accessories. Antwerp.
June 26-July 25—Commercial vehicles, tractors, camions and engines. Antwerp.
July 9-20—London, England. International Aircraft Exhibition. Olympia. The Society of British Aircraft Constructors.
Aug. 7-Sept. 15—Motorcycles, sidecars, etc. Antwerp.
October—London. Commercial Vehicle Show. Olympia.
November—London. Passenger Car Show. Olympia.

CONTESTS

May 1—Hanford, Cal. Dirt track.
May 31—Indianapolis, Ind. Speedway.
May 31—Brockport, N. Y. Dirt track.

June 1—Omaha, Neb. Truck Reliability Run.

June 12—Uniontown, Pa. Speedway.

June 17—Portland, Ore. Dirt track.

June 17-18—Chicago. Inter-Club Run. Chicago Automobile Club.

June 19—Ogdensburg, N. Y. Dirt track.

July 4—Tacoma, Wash. Speedway.

July 4—Hanford, Cal. Dirt track.

July 4—Spokane, Wash. Dirt track.

July 5—Batavia, N. Y. Dirt track.

July 17—Warren, Pa. Dirt track.

July 24—Watertown, N. Y. Dirt track.

July 31—Fulton, N. Y. Dirt track.

Aug. 7—Erie, Pa. Dirt track.

Aug. 14—Buffalo, N. Y. Dirt track.

Aug. 20-21—Middletown, N. Y. Dirt track.

Aug. 21—Johnstown City, Pa. Dirt track.

Aug. 21—Elgin, Ill. Road race. Chicago Automobile Club.

Aug. 28—Canandaigua, N. Y. Dirt track.

Aug. 27-8—Flemington, N. J. Dirt track.

August, 1920—Paris, France. Grand Prix Race. Sporting Commission Automobile Club of France.

Sept. 1—Glidden Tour—N. Y. to San Francisco.

Sept. 5—Targa Florio Race, Sicily.

Sept. 6—Hornell, N. Y. Dirt track.

Sept. 6—Cincinnati, O. Speedway.

Sept. 6—Uniontown, Pa. Speedway.

Sept. 17-18—Syracuse, N. Y. Dirt track.

Sept. 25—Allentown, Pa. Dirt track.

Oct. 1-2—Trenton, N. J. Dirt track.

Oct. 8-9—Danbury, Conn. Dirt track.

CONVENTIONS

May 9-12—Independent American Petroleum Congress, Congress Hotel, Chicago.

May 12-15, 1920—San Francisco. Seventh National Foreign Trade Convention.

May 20-30—Atlantic City. Third American Aeronautic Congress. Aero Club of America.

May 24-26—Indianapolis. Service Managers' Convention. National Automobile Chamber Commerce, Service Division.

June 7-10—Indianapolis, Ind. Annual Convention of the Associated Advertising Clubs.

June 7-11—Del Monte, Cal. Automotive Equipment Association. Directors' Meeting, 7-8; General Sessions 10-11.

June 22-25—Asbury Park, N. J. Annual meeting American Society for Testing Materials.

S. A. E. MEETINGS

June 21-25—Ottawa Beach, Mich. Summer Conference.

MORTGAGE LOAN PLAN TAKEN UP IN BUFFALO

(Continued from page 1029)

be able to get first mortgage loans from banks.

An executive of the Pierce-Arrow Motor Car Co. said to-day that the housing situation had not yet become a company proposition with that concern. It is believed, however, that the automotive industry here will feel acutely the scarcity of houses when the big Dunlop tire plant gets into action, unless the number of houses here is greatly increased in the meantime.

Kansas City Does Not Find Conditions Acute

KANSAS CITY, MO., April 22—Kansas City has outlined a definite program for finding out whether it has a housing problem. Should it be discovered that industry is being hampered for lack of living quarters for workers, a housing corporation is to be formed, to build houses where needed.

The preliminary investigations are being made by the Chamber of Commerce. A questionnaire was sent to employers of large numbers, seeking definite information as to the employees who wanted places to live, whether they would rent or buy, how much they could pay down on homes, and so forth. Less than 50 per cent of the firms returned any answers, so that data are incomplete.

The lack of full returns indicates, it is interpreted, that the housing problem is not worrying employers. Possibly the problem is not serious regarding workers, for the complaint of inadequate housing may come chiefly from people

wanting better classes of houses. Many new homes are being built in Kansas City by corporations and by individuals, for personal use or for sale. There is said to be more building in Kansas City than in most other cities.

No Results Apparent From Boston Surveys

BOSTON, April 24—Housing surveys have followed each other in Boston until they are tiresome. Even before the conditions became acute the legislature and the Boston Planning Board took up the matter and tried to plan remedies; but there has been nothing but talk.

Boston has lost cigar, candy and some other plants because of the scarcity of help and housing conditions. One big plant went to Philadelphia and another to New Jersey. When some of the big automobile warehouses and service stations are finished, giving employment to large forces, the industry will be in as serious a way as the others. That will be about next fall.

Want to Pitch Tents in Philadelphia Park

PHILADELPHIA, April 24—Housing facilities are so inadequate in Philadelphia that business men's associations constantly are holding meetings to express their indignation over the situation. Application has been made by residents of one ward to permit the homeless or those who have been evicted to pitch tents in the George's Hill district of Fairmount Park.

In brief, Philadelphia still is 35,000 dwellings "shy." The Housing Commis-

sion apparently has been marking time, but those on the inside assert that there is nothing else for it to do until building has been speeded up by private enterprise. The automotive field is not as seriously affected as many trades. Most of the motor mechanics received high wages even before the war, as there was a marked scarcity of experts even then. They were of the saving type and quickly purchased their homes, many through building and loan associations.

Atlanta Considering Sectional Bungalows

ATLANTA, GA., April 22—Men of the automobile and other industries here are giving serious consideration to the housing problem, realizing that comfortable home conditions will alleviate to a large extent the existing industrial unrest.

A number of the larger concerns have taken steps from time to time for the improvement of housing conditions for their employees, and the matter of housing has been discussed considerably by associations, the members of which agree upon the importance of solving the problem. No concerted plan has yet been adopted, however, and the shortage and cost of building materials, together with the shortage of labor and transportation difficulties, have made the problem more difficult of solution.

The Simms Motor Car Corp., which is to establish a factory here for the manufacture of a light, popular priced car, is giving particular consideration to the housing problem. J. H. Simms, vice-president and sales manager of the corporation, is considering the purchase of a large number of bungalows.

AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

Vol. XLII
Number 11

PUBLISHED WEEKLY AT 239 WEST 39th STREET
NEW YORK, MARCH 11, 1920

Twenty cents a copy
Three dollars a year

Champion Dependable Spark Plugs

2½ Times Stronger

HOW many plugs were broken in your plant last year because a wrench slipped?

Champion "3450" Insulator is 2½ times as strong as the best previous material.

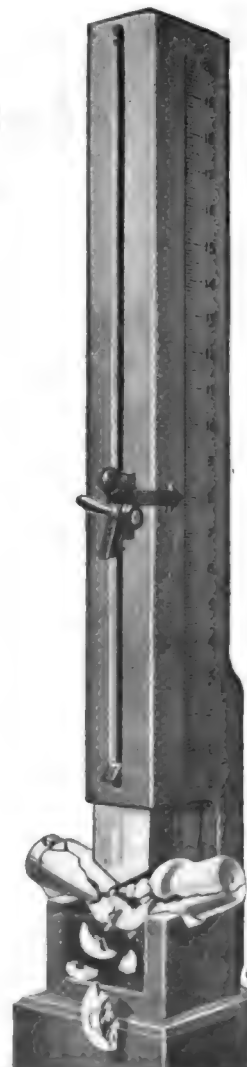
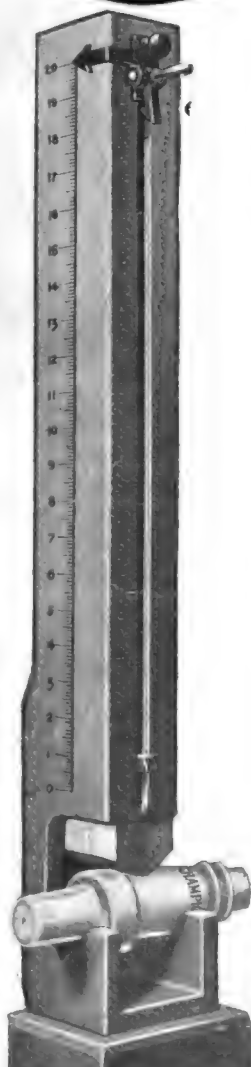
This high resistance to breaking, cracking or splitting was developed in Champion Spark Plugs by three thousand four hundred and fifty experiments, representing ten years of effort.

Engineers know that faulty functioning of the spark plugs causes unwarranted dissatisfaction with other parts of the car.

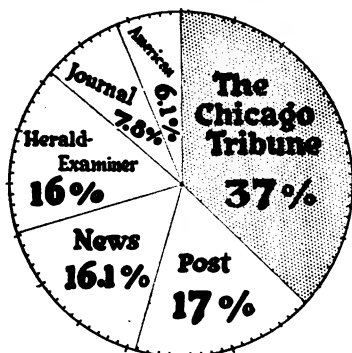
Specify Champion—the plug with a Factor of Safety.

Champion Spark Plug Company
Toledo, Ohio

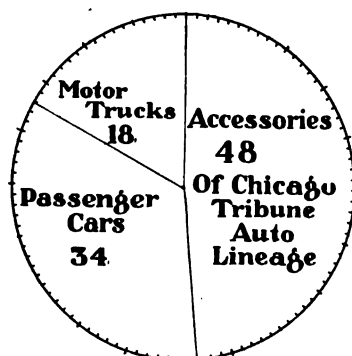
Champion Spark Plug Company, of Canada, Ltd., Windsor, Ont.



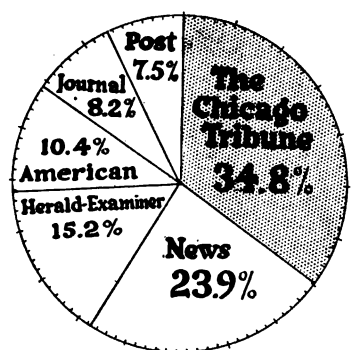
Inside Facts On The Division Of Motor Advertising In Chicago



Motor Lineage All Papers, 1919



What Chicago Tribune Lineage Consists of



Total Advertising All Papers, 1919

Here is a chart which pictures the composite judgment of motor advertisers in placing business in Chicago newspapers. You can see at a glance what proportion of the total lineage was carried by each paper during 1919. Figured on a basis of money spent, The Tribune's leadership would be even greater, since its rate is much higher than that of any other Chicago newspaper.

Tail Almost Wags the Dog

The chart opposite shows the percentage of Chicago Tribune motor advertising utilized by each of the three named sub-classifications. The space devoted to articles used in and on cars is almost equal in volume to that used for the cars and trucks themselves. This business news of tires, spark plugs, carburetors, oil, etc., gives variety to the advertising columns of The Chicago Tribune and sustains the interest of motorists.

Unique Position of The Chicago Tribune

The first chart above pictures The Chicago Tribune as printing 37% of the total motor advertising in Chicago. The chart opposite shows that The Tribune prints 34.8% of all advertising—display and classified, local and national. Note that The Tribune carried more than the two leading evening papers combined. The prestige of The Tribune, together with the circulation of 400,000 Daily and 750,000 Sunday, makes it the dominating factor in the Chicago field.

The Chicago Tribune
 THE WORLD'S GREATEST NEWSPAPER

The Charts On This Page Are Typical Of The Scores Of Graphs and Maps In The Chicago Tribune's 1920 Book Of Facts, Which Will Be Mailed Free If Requested on Business Stationery.

AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

Vol. XLII
Number 12

PUBLISHED WEEKLY AT 39 WEST 39TH STREET
NEW YORK, MARCH 18, 1920

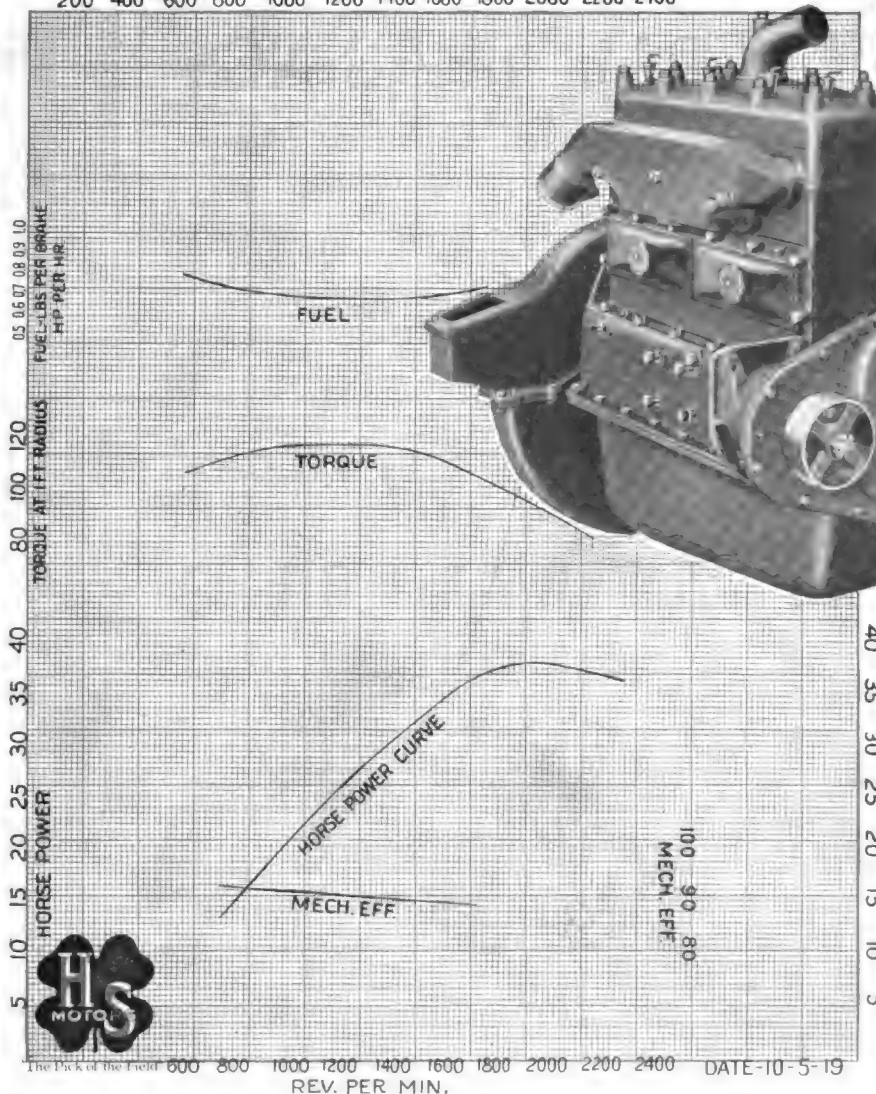
Twenty cents
Three dollars

Herschell-Spillman Motors

NAME OF MANUFACTURER-HERSCHELL SPILLMAN MOTOR CO.
NO. CYLS. 4, BORE $3\frac{1}{2}$ " STROKE 5", DISP 1924 CU. IN., FUEL GASOLINE, BOSCH MAGNETO
VARIABLE SPARK, AC SPARK PLUGS $1\frac{1}{4}$ " ZENITH CARBURETOR MODEL HP 5 B,
CLEARANCE VOLUME 21.0 %

200 400 600 800 1000 1200 1400 1600 1800 2000 2200 2400

Model 7000
 $3\frac{1}{2}$ " x 5"
Four Cylinder

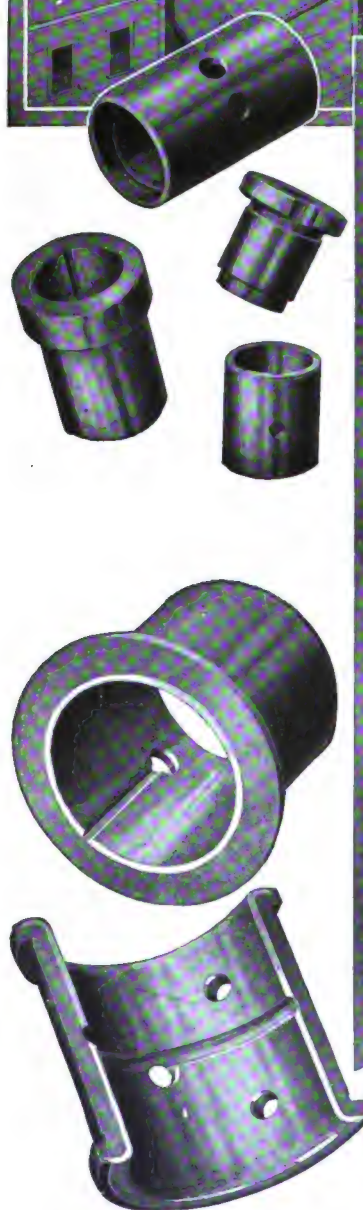
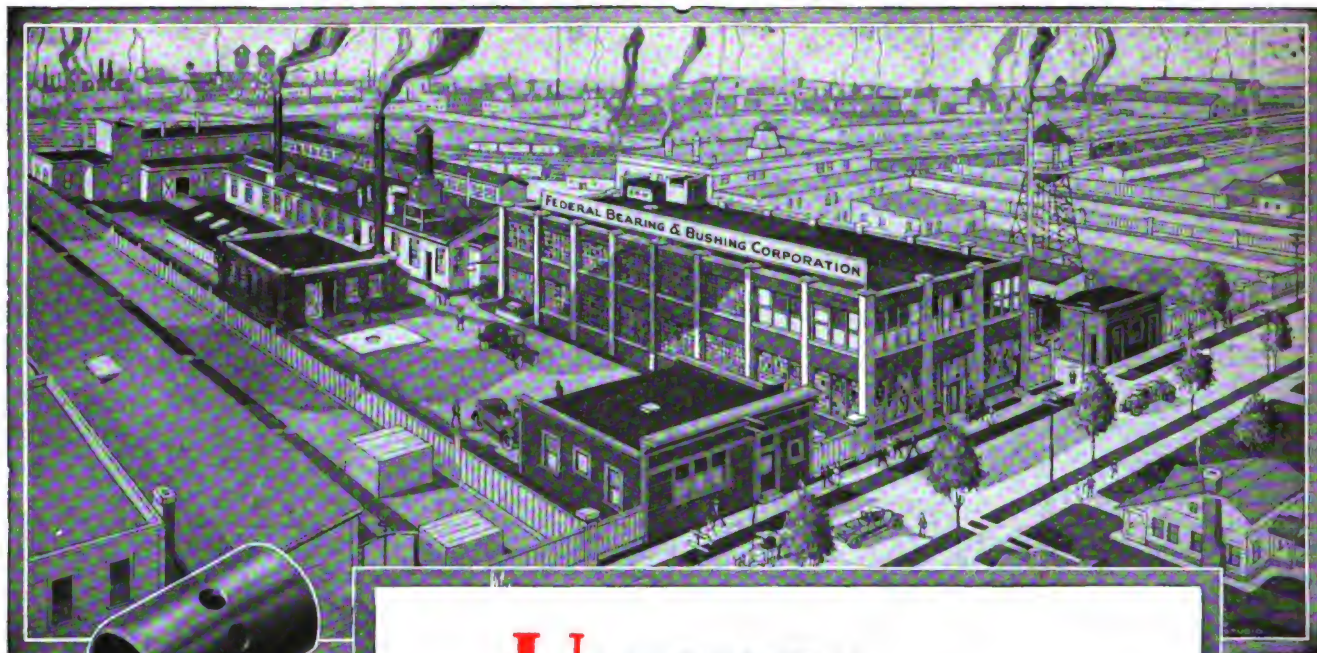


Power Plus

Proved by tests as charted---makes this motor the ideal for passenger and light commercial vehicles.

The Herschell-Spillman Model 11000- $3\frac{1}{4}$ " x 5"-6 Cylinder Motor is correspondingly efficient. Ask for descriptive folder.

HERSCHELL SPILLMAN MOTOR CO.
North Tonawanda,
New York



UNIFORMITY
SOLIDITY
EXCELLENCE
FEDERAL BEARINGS

WHY does every Federal Bearing show the same tough, fine grained, homogeneous structure in the fracture of the Babbitt lining?

BECAUSE every Bearing is chilled immediately after it is lined. That is UNIFORMITY.

WHY is every Federal Bearing guaranteed absolutely free from porosity?

BECAUSE the process of manufacture makes it impossible for the Babbitt to contain air while cooling. That is SOLIDITY.

WHY is every Federal Bearing manufactured from the highest grade materials, machined accurately and subjected to the most rigid inspection?

BECAUSE "FEDERAL DETROIT" must be stamped on the back. That is EXCELLENCE.

What Is Our Secret?

CENTRIFUGAL FORCE

(Process Protected by Patents)

THINK



FEDERAL BEARING & BUSHING CORPORATION
BABBITT-LINED BRONZE-BACK BEARINGS - BRONZE BUSHINGS - BRONZE CASTINGS
DETROIT - MICHIGAN

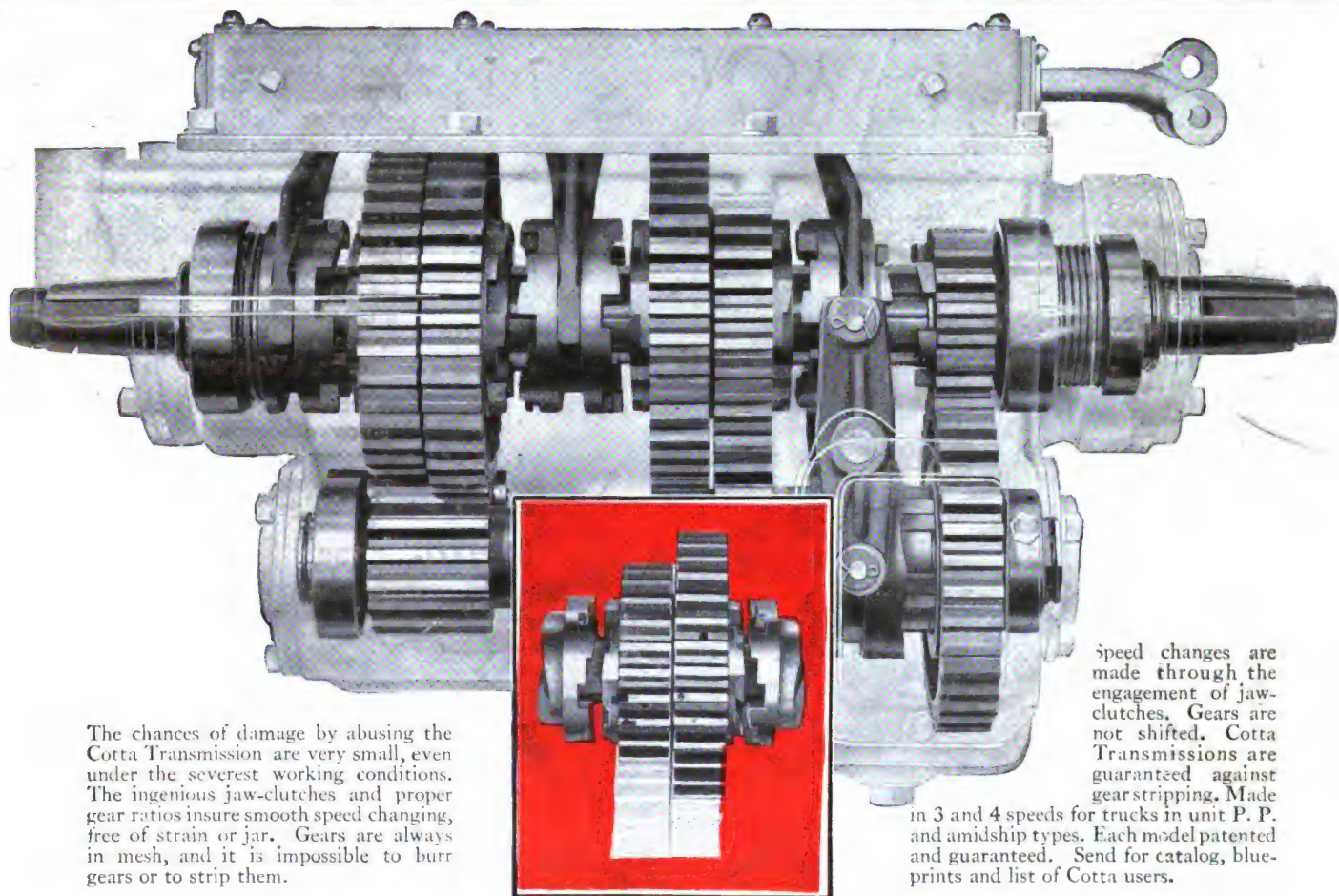
AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

Vol. XI,II
Number 13

PUBLISHED WEEKLY AT 239 WEST 39th STREET
NEW YORK, MARCH 25, 1920

Twenty cents a copy
Three dollars a year



The chances of damage by abusing the Cotta Transmission are very small, even under the severest working conditions. The ingenious jaw-clutches and proper gear ratios insure smooth speed changing, free of strain or jar. Gears are always in mesh, and it is impossible to burr gears or to strip them.

Speed changes are made through the engagement of jaw-clutches. Gears are not shifted. Cotta Transmissions are guaranteed against gear stripping. Made in 3 and 4 speeds for trucks in unit P. P. and amidship types. Each model patented and guaranteed. Send for catalog, blue-prints and list of Cotta users.

COTTA TRANSMISSION COMPANY, ROCKFORD, ILL.

"Largest Exclusive Makers of Truck and Tractor Transmissions"



COTTA

TRUCK AND TRACTOR TRANSMISSIONS

Gears Always in Mesh

Stewart

(MAGNETIC TYPE)

SPEEDOMETER

\$25

NO accessory has ever achieved such universal popularity with car owners and car makers as the Stewart Speedometer. This explains why it is standard equipment on 95 per cent of all cars.

Automotive engineers have satisfied themselves that for accuracy, reliability and durability the Stewart has no equal, or near-equal. There can be no other speedometer like the Stewart. Its magnetic principle, proven to be the only dependable principle, is controlled exclusively by Stewart-Warner's basic patents.

Car makers, therefore, do not care to take chances with any other make. They **know** it is the **one** accessory most every buyer looks for on a car. They **know** that a Stewart Speedometer actually helps to sell the car.

Stewart-Warner Speedometer Corp.,
Chicago, U. S. A.



Other Stewart Custombilt Necessities

Warner Auto Meter

Standard Model \$40.00
Deluxe Model. 75.00

Warning Signal

(Motor Driven)

Standard Model . . . \$10.00
Larger, Deluxe Model. 15.00
Popular Priced Model . 6.50

Warning Signal

(Hand-Operated)

Standard Model . . . \$4.75
Popular Priced Model 3.75

Searchlight

Standard Model..... \$ 7.50
Deluxe Model. 15.00
Popular Priced Model 4.75

Vacuum System

\$13.50

Autoguard

Bolted-on Type \$10.00
Side-Clamp Type 13.50
Ford and Chevrolet
Models 10.00



Warner Auto-Meter

Deluxe Model \$75.00
Standard Model. 40.00



Stewart Speedometer
For Ford Cars \$15.00



Stewart Speedometer
For Motor Trucks \$35.00

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The AUTOMOBILE

Vol. XLII
Number 14

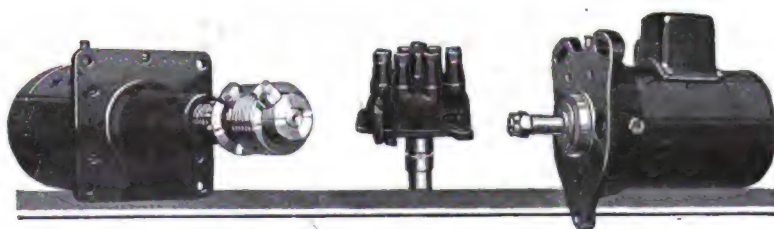
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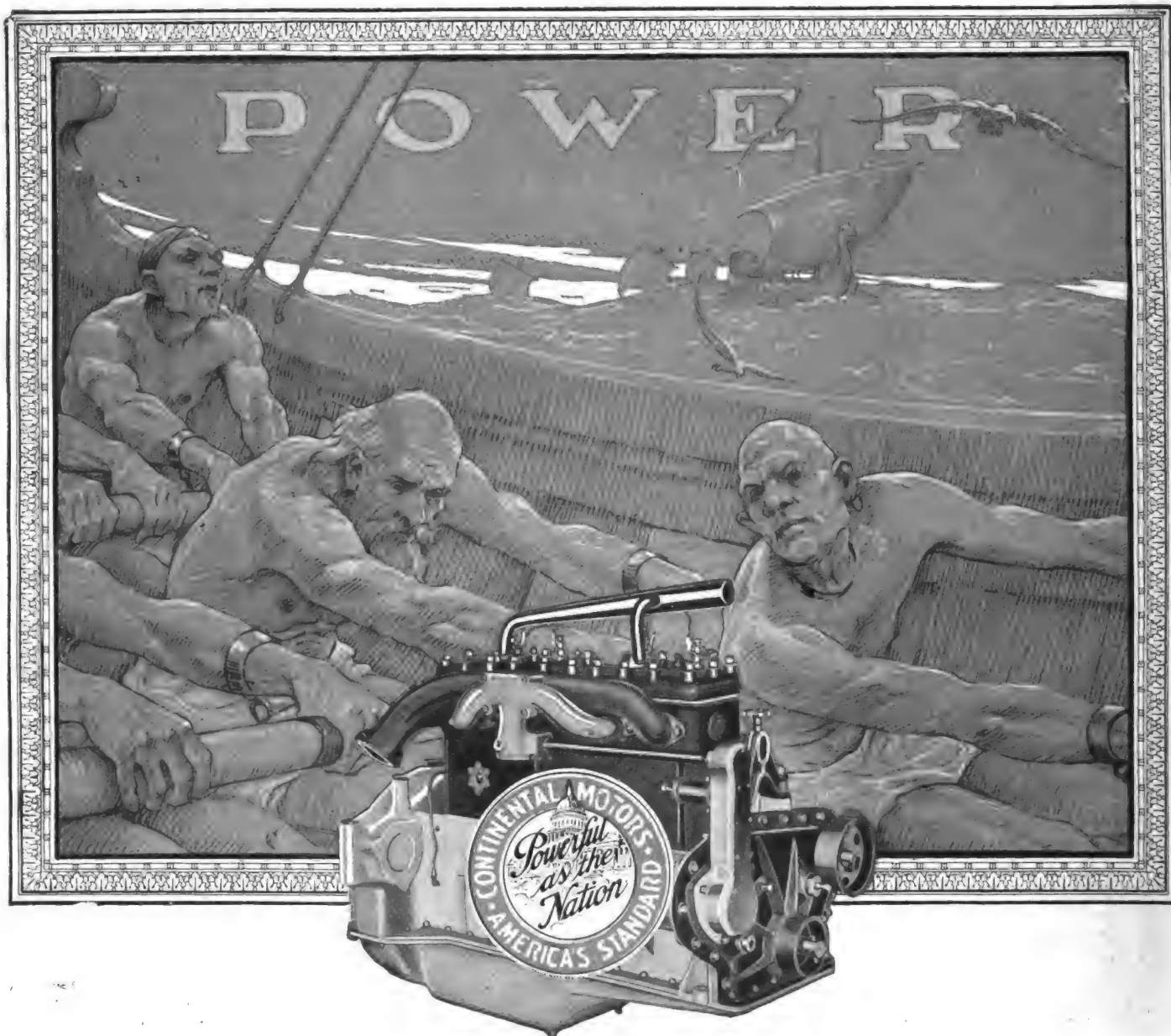
ATWATER KENT

Ignition, Starting and Lighting

ATWATER KENT equipment is manufactured to the highest standards of accuracy and precision and truly reflects the personality and ideals of the founder of this business—to make and market a product as good as material, experience and the most exacting workmanship can make it.



ATWATER KENT MFG. COMPANY *Philadelphia*
4938 STENTON AVENUE



Just as the body-power of man was at one time MULTIPLIED to produce the energy required for performing giant tasks, so today, is the brain-power of every individual of the Continental organization MULTIPLIED to produce the Red Seal Motor. ● The production of so vital a part of the motor car or truck or tractor

is a project that is worthy of the highest type of specialization. ● Only by UNDIVIDED EFFORT—only by CONCENTRATION upon this one vital product, could the Continental Motor be of the high standard of quality that the world looks for and finds, in the product which is Continental equipped.

CONTINENTAL MOTORS CORPORATION

Offices: Detroit, Michigan

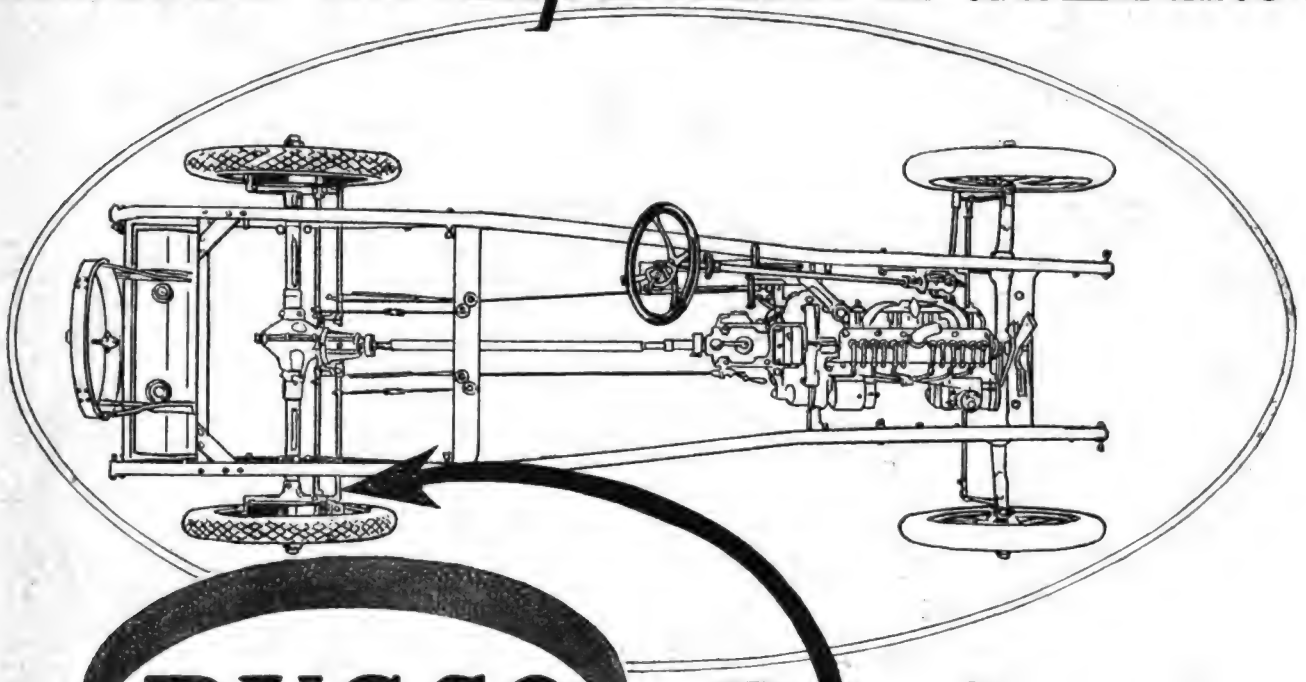
Factories: Detroit-Muskegon

Largest Exclusive Motor Manufacturers in the World

Continental Motors

STANDARD POWER FOR TRUCKS, AUTOMOBILES AND TRACTORS

Consider the Importance of the Brakes



RUSCO Brake Lining and Clutch Facings

THE engine, the transmission, the chassis, are all important—but what's more important than the brakes? If lined with Rusco, they instantly respond to every demand.

Why not equip your cars with Rusco, the nationally advertised brake lining that more and more car owners are specifying? They are guaranteed for one year.

Other good selling Rusco Products in which quality is pre-eminent are: Fabric Fan Belts, Tire Straps, Top Straps, Hood and Radiator Lacings and Transmission Lining for Ford Cars.

Write for our valuable Rusco Automotive Products Book

THE RUSSELL MANUFACTURING CO.

38 FACTORY BUILDINGS
503 RUSSELL AVENUE

New York, 349 Broadway
Atlanta, 60 S. Forsyth St.

Established 1830

BRANCH OFFICES:

25,000 SHUTTLES
MIDDLETOWN, CONNECTICUT

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Detroit, 226 Jefferson Ave.

FAFNIR

Efficient Power Transmission

The utmost economy in power transmission and the use of high grade ball bearings are inseparable. By installing ball bearings in the clutch, transmission, on the jack shaft, in the differential and on the rear axle, the maximum power generated by the motor performs useful work in driving the car.

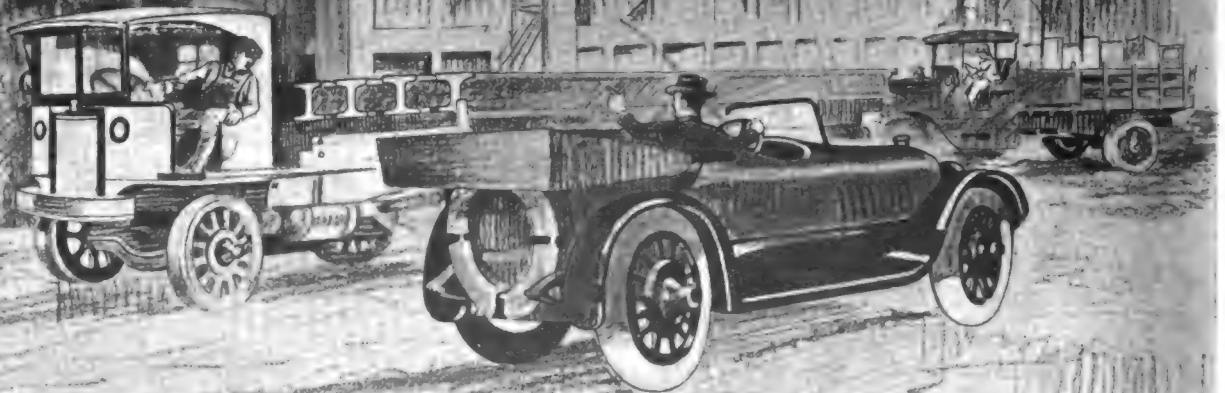
The material, workmanship and accuracy of FAFNIR BALL BEARINGS have earned for them the reputation of being

CONSISTENTLY HIGH GRADE.

THE FAFNIR BEARING COMPANY

Conrad Patent Licensee
New Britain, Conn.

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AUTOMOTIVE INDUSTRIES

AUTOMOBILE

THE CLASS JOURNAL COMPANY
239 WEST 39th STREET NEW YORK CITY

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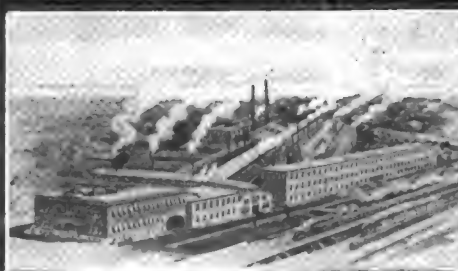


IDEALS

WYMAN-GORDON forgings are our ideals expressed in the best metal, honestly designed and made to fit your individual requirements, combined with the most progressive forging methods. Their reputation for excellence in the engineering fraternity is prima facie evidence that the Wyman-Gordon way is the ideal way.

Our Engineering and Metallurgical Departments will be glad to discuss with you your forging requirements. This service is always available, without charge.

WYMAN-GORDON
THE CRANKSHAFT MAKERS
WORCESTER, MASS. CLEVELAND, OHIO.



GURNEY

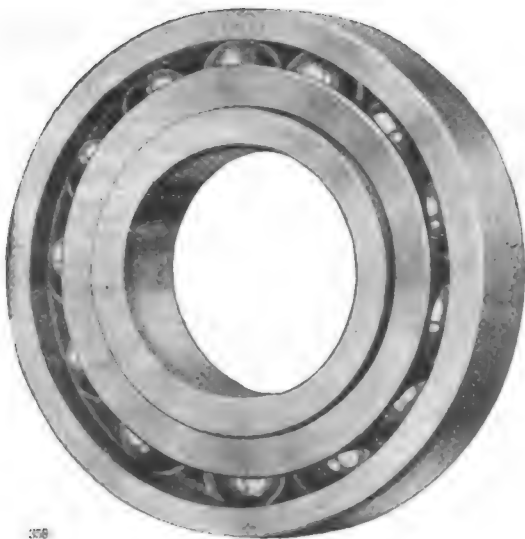
BALL BEARINGS

Their Load Capacity Is Greater

The exceptional load capacity of Gurney Bearings is due to two specific causes, by virtue of the design of the bearing and the process of assembling, it is possible to put into it, without the use of filling slots, the maximum number of the maximum size of balls. The advantage of this is too obvious for comment.

Secondly, there is realized for each ball of given size distinctly greater capacity than has heretofore been effected by virtue of the character of the raceways that are ground in the Gurney plant. By the advances in precision which have been worked out by us and by the closer conformity of race curvature to ball curvature thus made commercially possible, we have made possible and have realized a larger area of contact between ball and raceway and have thus actually gained a decided increase in ball capacity.

Our bearings are listed with greater load capacity than other makes. This sometimes arouses a little skepticism. But their ratings are in reality conservative. They are accounted for by the characteristics explained above.



R. W. Gurney

GURNEY BALL BEARING CO.

Conrad Patent Licensees

JAMESTOWN


N. Y.

IN the development of the automotive industry it has been demonstrated time after time that new business necessities always arise to demand new and improved methods of transportation.

During the difficult times through which our American Railways have been passing, and the consequent terrific strain thrown upon the transportation facilities of the country, the motor truck has become an essential factor in the various fields of merchandise distribution.

Just as the rapid growth of our cities and the diminishing rural populations began to threaten us seriously with a nation-wide food shortage, the farm tractor stepped into the breach, lowering the requirements in man power and increasing the possibilities of production on our farms.

The millions of cars now in service, while seeming an enormous number when lined up in print and first placed before our eyes, are in reality but a very small proportion of the number which will be needed in this country alone—to say nothing of the vast areas in South Africa, India, Australia, Mongolia and Manchuria, Siberia, and other countries, now more or less undeveloped, but in which tremendous strides will have been made in the next ten years.



Manufacturers are finding that nothing else so small is so large a factor in economy of adjustment as the laminated shim. Try it out.

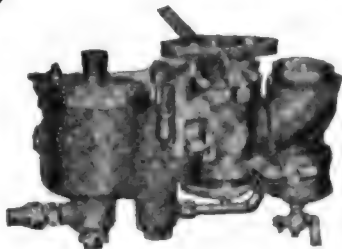
Laminated Shim Co., 533 Canal St., New York
Detroit: Dime Bank Bldg. St. Louis: Mazura Mfg. Co.
England: R. A. Rothermel, 24-25 Maddox St., Regent St.,
London, W. I.



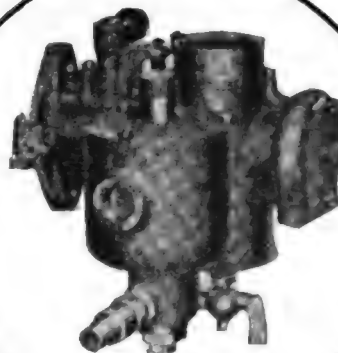
HERE

LAMINUM

Practical Tests Prove Rayfield Superiority



MODEL G



MODEL M

Those motor car manufacturers using Rayfield Carburetors as standard equipment on their product know the superiority of Rayfield performance.

Those manufacturers who are not using Rayfield Carburetors need only to give

them a thorough test on their motors to be equally convinced.

We are glad to co-operate with you in making these tests. Our engineers are ready to work with yours in developing the full power designed in your motor.

BENEKE & KROPF MFG. CO.

21st & Rockwell Sts.

Chicago, Ill.

RAYFIELD

CARBURETORS

FAY AUTOMATIC LATHE

The FAY WAY of MACHINING PISTONS

Standardizing the Manu- facture of Pistons

After an extended investigation to determine the best way to perform the various machining operations to produce high-grade pistons and in consultation with makers of pistons on a large scale, we have developed a process which

Insures Pistons of the Highest Grade at the Lowest Labor Cost

Simplicity in tooling, decreasing the number of operations and making operations automatic wherever possible to permit the use of unskilled labor, has been our guiding motive.

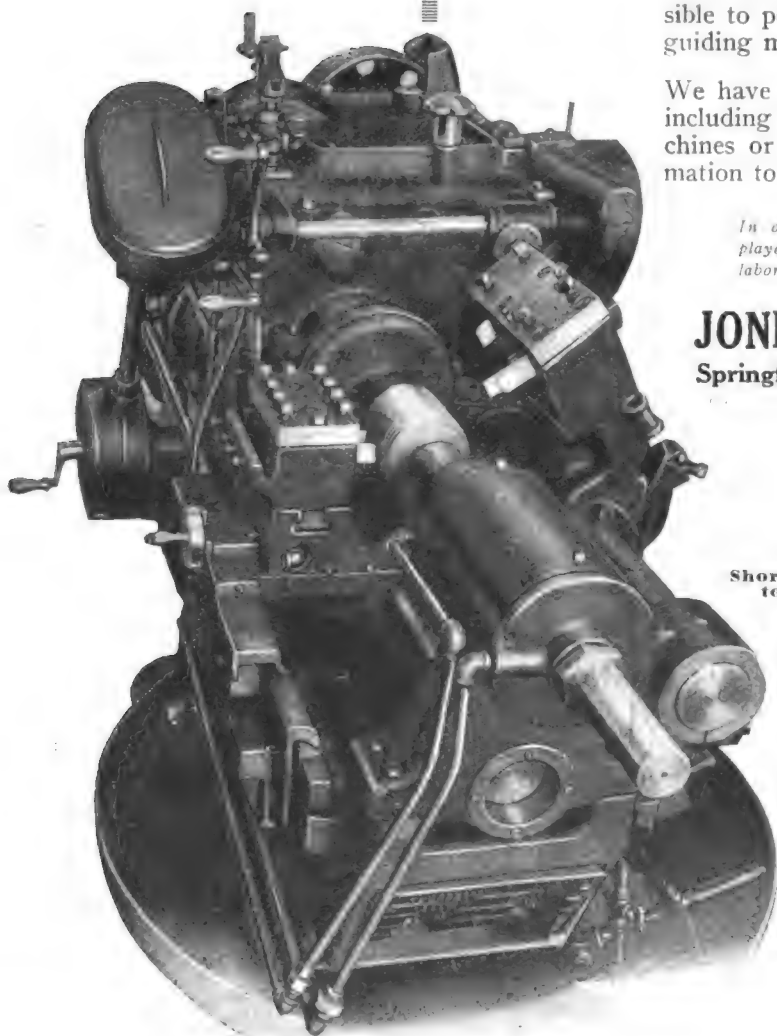
We have prepared complete data covering this method, including every operation, whether done on our machines or not, and shall be pleased to send this information to interested manufacturers.

In our following advertisements we will show the part played by the Fay Automatic Lathe in this time and labor-saving method.

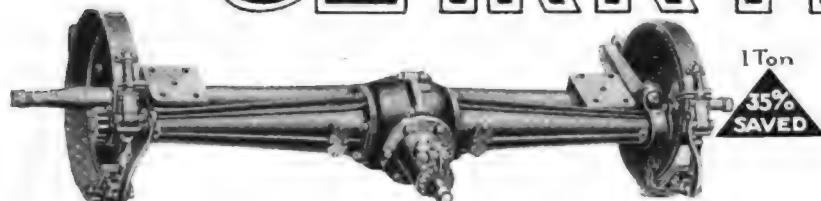
JONES & LAMSON MACHINE CO.
Springfield, Vermont

*Second Operation "The
Fay Way of Machining
Pistons"*

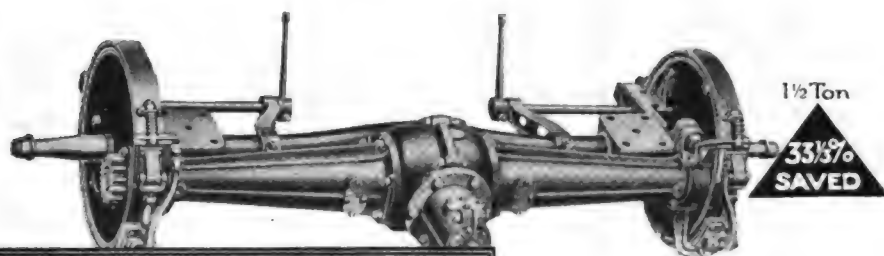
Machine
Short Bed Fay Au-
tomatic Lathe



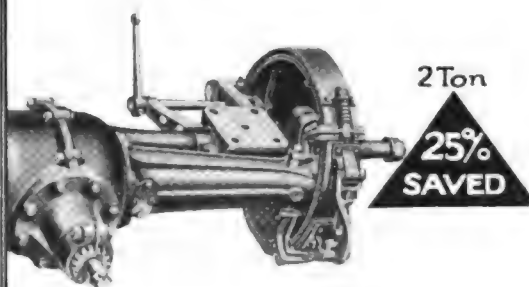
A Saving in Unsprung Weight in Every Capacity of CLARK AXLES



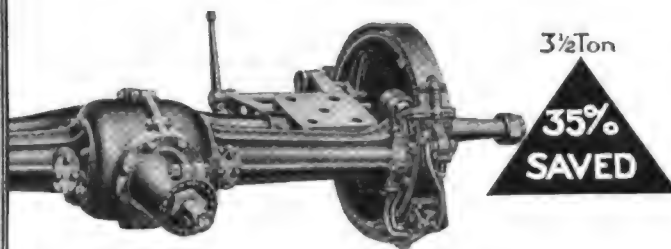
1 Ton

35%
SAVED

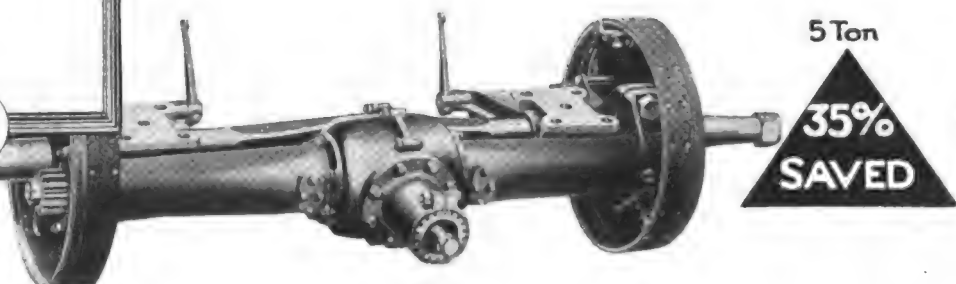
1 1/2 Ton

33 1/3%
SAVED

2 Ton

25%
SAVED

3 1/2 Ton

35%
SAVED

5 Ton

35%
SAVED

Clark Internal Gear Axles are made in sizes from one to five tons capacity as illustrated. The pyramids show the saving in unsprung weight of Clark Axles as compared with other type axles.

UNSPRUNG weight is said to be ten times as destructive to tires as weight *above* the springs.

Clark Axles save from 200 to 700 pounds in unsprung weight—they are that much lighter than other types of axles of similar capacity—and yet they are stronger for a given weight.

In Clark Internal Gear Axles most of the speed reduction is accomplished right at the wheels. Smaller torques and reaction strains require less weighty materials.

CLARK EQUIPMENT CO.
Buchanan, Mich.

**CLARK
EQUIPMENT**

BUILD GOOD ROADS
SHIP BY TRUCK

In the Packard Plant

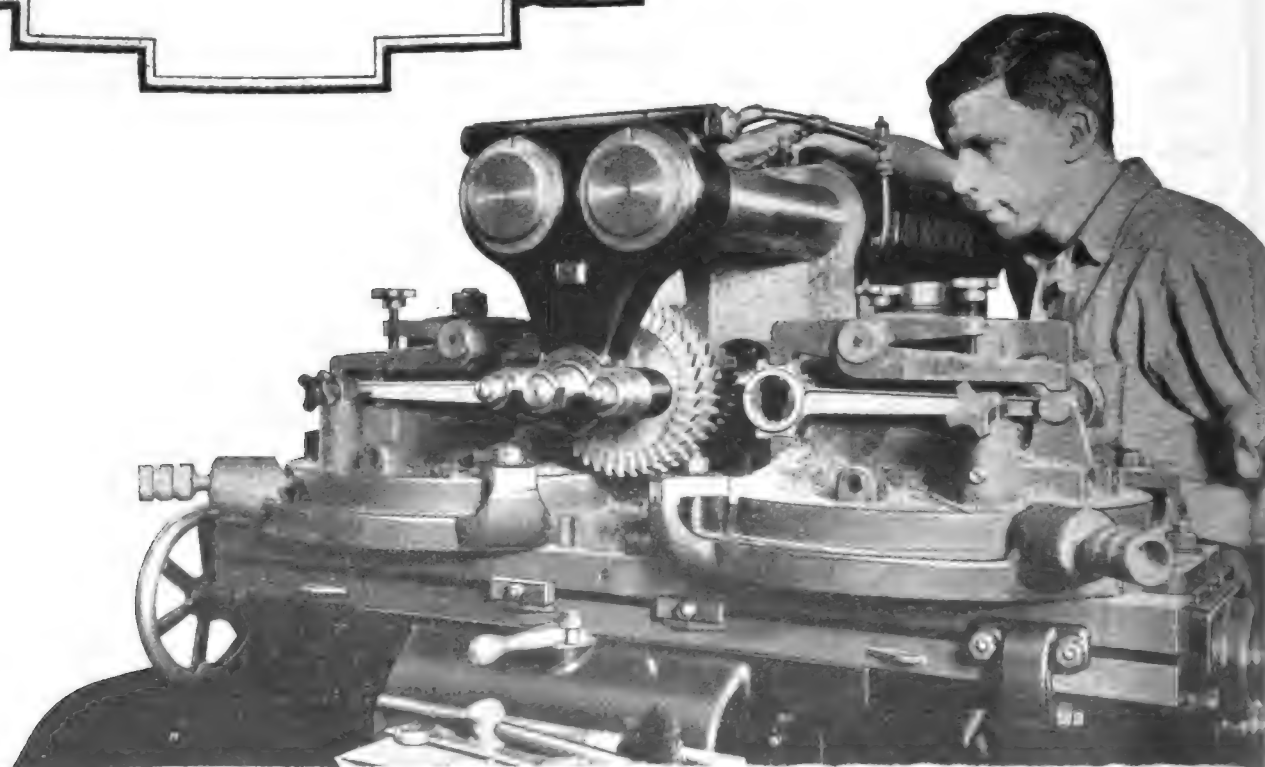
The double overarm which adds so much to the rigidity and accuracy of Milwaukee Milling Machines is here shown, upholding the high standard of accuracy set by one of the most prominent automobile manufacturing concerns in America. The double overarm maintains positive alignment of the arbor while the cutters are continuously straddle milling the large and small ends of connecting rods. In fact, the support of the arbor is so rigid that in this and many other instances the arm braces are omitted entirely.

This essential feature is largely responsible for the acceptance of Milwaukee Milling Machines in the foremost automotive production plants of the world—where rigidity, accuracy and production are absolutely necessary.

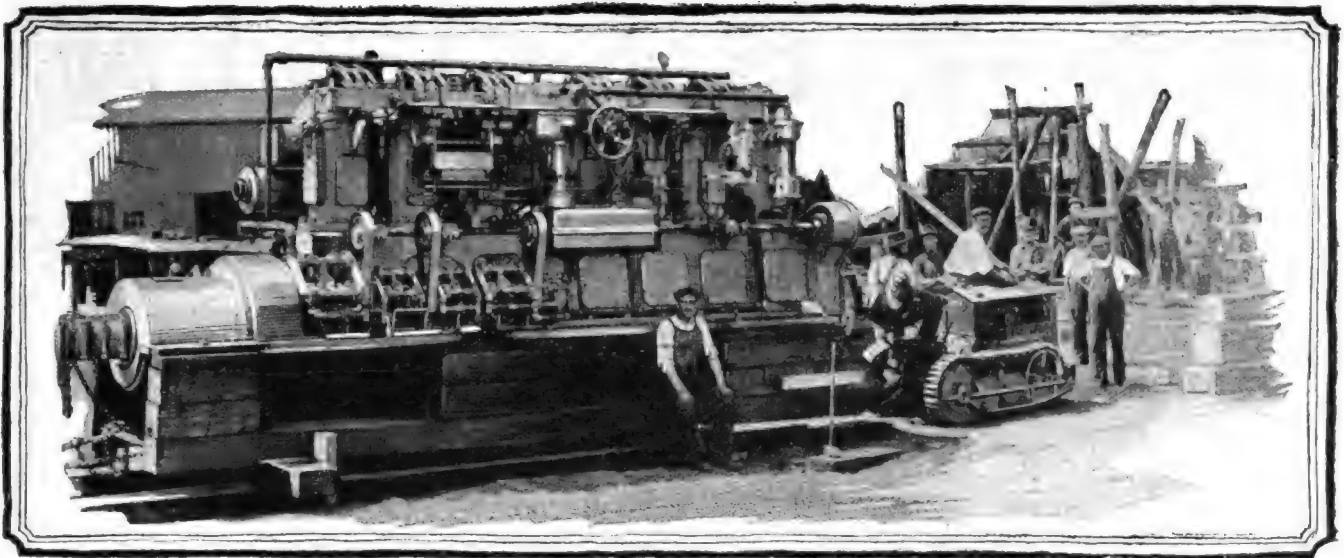
It is also but another feature indicative of the maker's forethought in superior design.

Write for catalogue.

Milwaukee Milling Machines



KEARNEY & TRECKER Co. Milwaukee, Wis. U.S.A.

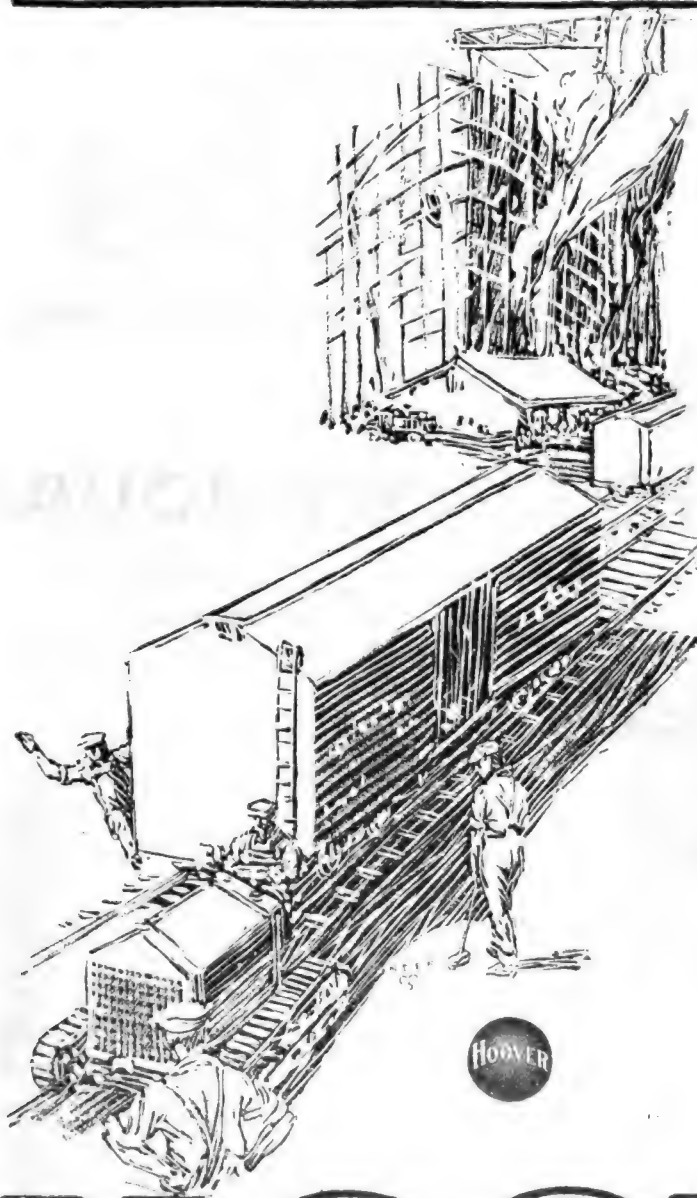


The Cletrac Hauling a 27-Ton Diesel Engine

Like pulling a toy express wagon—this is how well-poised ball bearings working on little steel balls make the hauling of the huge monsters of steel for modern industry.

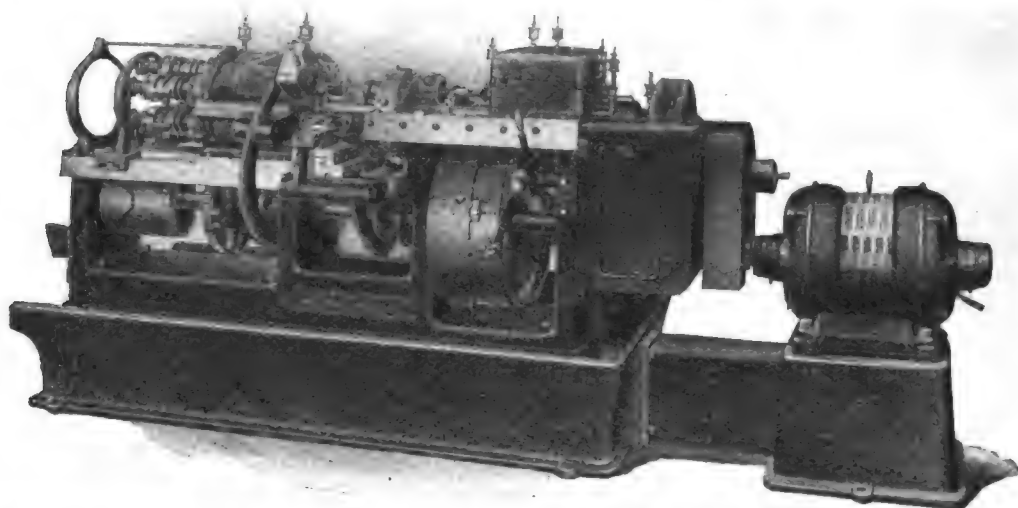
By devoting unceasing effort in research and manufacturing, Hoover Engineers have produced Hoover Steel Balls of such perfect roundness and fineness of finish that they make easier work of hauling huge machinery.

HOOVER STEEL BALL COMPANY
Ann Arbor Michigan



HOOVER
STEEL BALLS

NEW BRITAIN



AUTOMATICS



163 PRIMING CUPS EVERY HOUR!

WHEN each "Six-spindle New Britain" is turning out work at this rate—then you have Production Plus.

And quantity isn't all—Every piece accurate to the last merciless gauging and well finished.

*Increase your production but
Decrease your payroll.*



"New Britain" Six-Spindle Automatic With Motor Drive.

On large contracts where quality is as essential as quantity this Automatic affords a decided advantage because you can predetermine your production. This is the ideal way of meeting the production problems of to-day—it eliminates guess work.

If you will send us sketches or samples of work that needs jacking-up, we will gladly submit estimates and offer a solution of your problem. Capacities: $\frac{5}{8}$ " to $2\frac{1}{2}$ " diam.

THE NEW BRITAIN MACHINE COMPANY

New Britain, Conn., U. S. A.



Single Row

Double Row

ANNULAR BALL BEARINGS

BALL Bearings must be of finer steel, more accurately machined and capable of more critical duty than any other part of an automobile, truck, tractor or other mechanism demanding anti-friction bearings. Yet they do their work hidden away from sight; they must serve without attention or adjustment, yet be permanently proof against failure.

All the more reason why manufacturers of automobiles, trucks and tractors should use bearings of S. R. B. quality.

S. R. B. Ball Bearings and S. R. B. Taper Roller Bearings are used in those motor cars, trucks and tractors, whose names are instantly thought of as leaders in their respective fields.

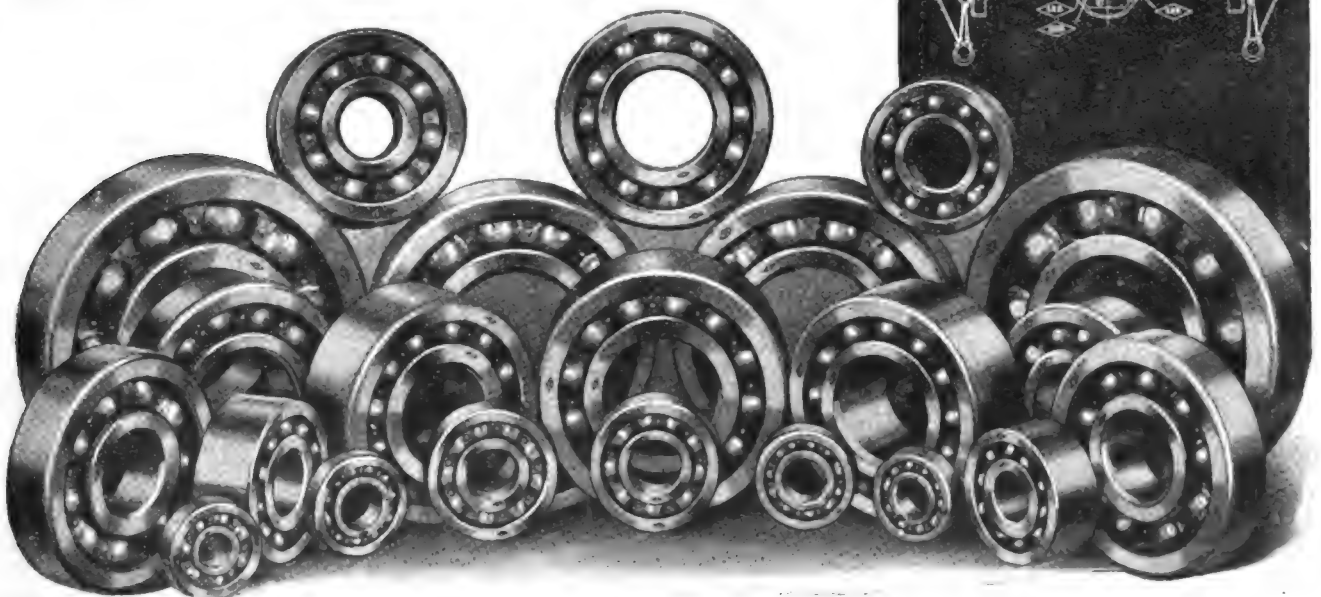
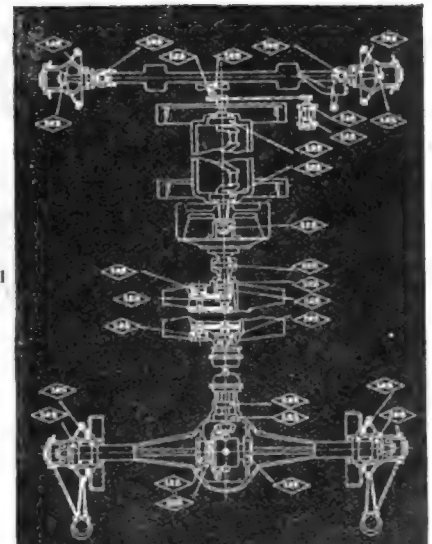
STANDARD STEEL AND BEARINGS INCORPORATED

Philadelphia Plainville, Conn. Norwich, Conn. New Haven, Conn. Pittsburgh
Standard Roller Bearing Co. Standard Sales and Service Distributors in Principal Cities Braeburn Steel Co.

Executive Offices: 347 MADISON AVENUE, NEW YORK CITY

Controlled and Operated by

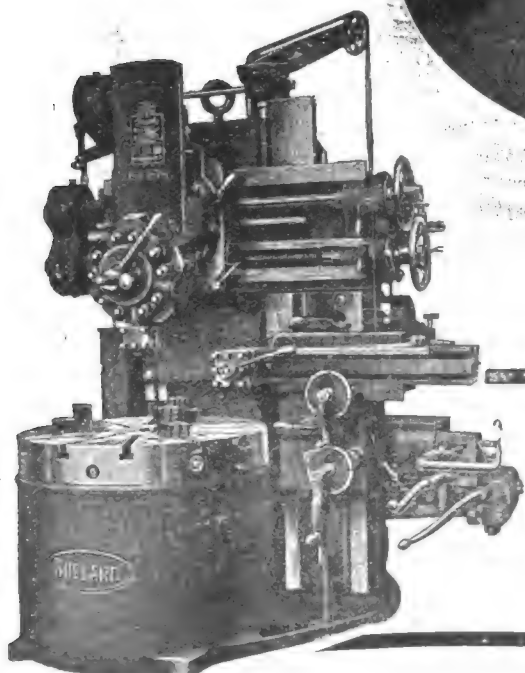
MARLIN-ROCKWELL
C O R P O R A T I O N



Typical S. R. B. Bearing Equipment for Modern Motor Car

VERTICAL TURRET LATHE

Floor Space!

*At a Premium
Everywhere*BULL
YOUR PR

MULT-AU-MATIC
MORE THAN A MACHINE
A MANUFACTURING METHOD

TO BULLARDIZE Is to Obtain the Greatest Profit Per Man, Per Machine, Per Minute Per Inch of Floor Space

Never in the history of manufacturing was floor space such an important item at production conferences. Not only are building costs well-nigh prohibitive, but new buildings mean months of waiting, months when production will steadily fall backward, at a time when greater production is imperative.

What is to be done? And the answer is—BULLARDIZE YOUR PRODUCTION.

The Bullard Mult-Au-Matic is the machine for your plant if your output requires a series of machining operations—castings, forgings and bar stock cut to lengths, that require boring, facing, turning, threading, drilling, tapping, etc., singly or in combination.

The six stations will take the job from floor to finish and but one man is required to watch the loading station. The entire job is finished in the time it takes to do the longest operation and there is no time lost between cuts.

Every manufacturer of cars, trucks, tractors, motors, wheels and other parts needs the Vertical Turret Lathe. Most manufacturers use it. This machine is now needed more than ever because convenience and power operation of all parts possible reduce the "time gaps" between cuts to the final minimum. Simultaneous cuts on various surfaces, through the use of both Main Head and Side Head, shorten the time on the job to a tremendous extent. These features combine to make the "Bullard Vertical" a most profitable investment for work within its capacity.

Shops that have Bullardized Production are getting sixty working seconds out of every minute and sixty minutes out of every hour, have released many men for other duties, are getting every bit of production and profit possible from every inch of floor space.

Bullard Engineering Service

is at your service, ready to study your particular problems on the machining of flywheels, pistons, gear blanks, sprockets, differential cases, motor parts, etc., ready to show you by figures and performance just what BULLARDIZING YOUR PRODUCT will mean. Send samples or blue-prints with machining specifications. Literature on request.

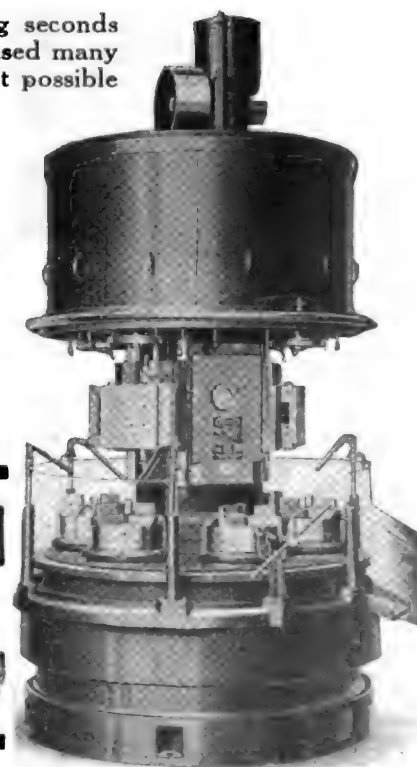
THE BULLARD MACHINE TOOL CO.

Bridgeport

Connecticut

Also Builders of the Production-famous Boring Mill—The Maxi-Mill

BULLARDIZE PRODUCTION



W & S Turret Lathes for increasing production

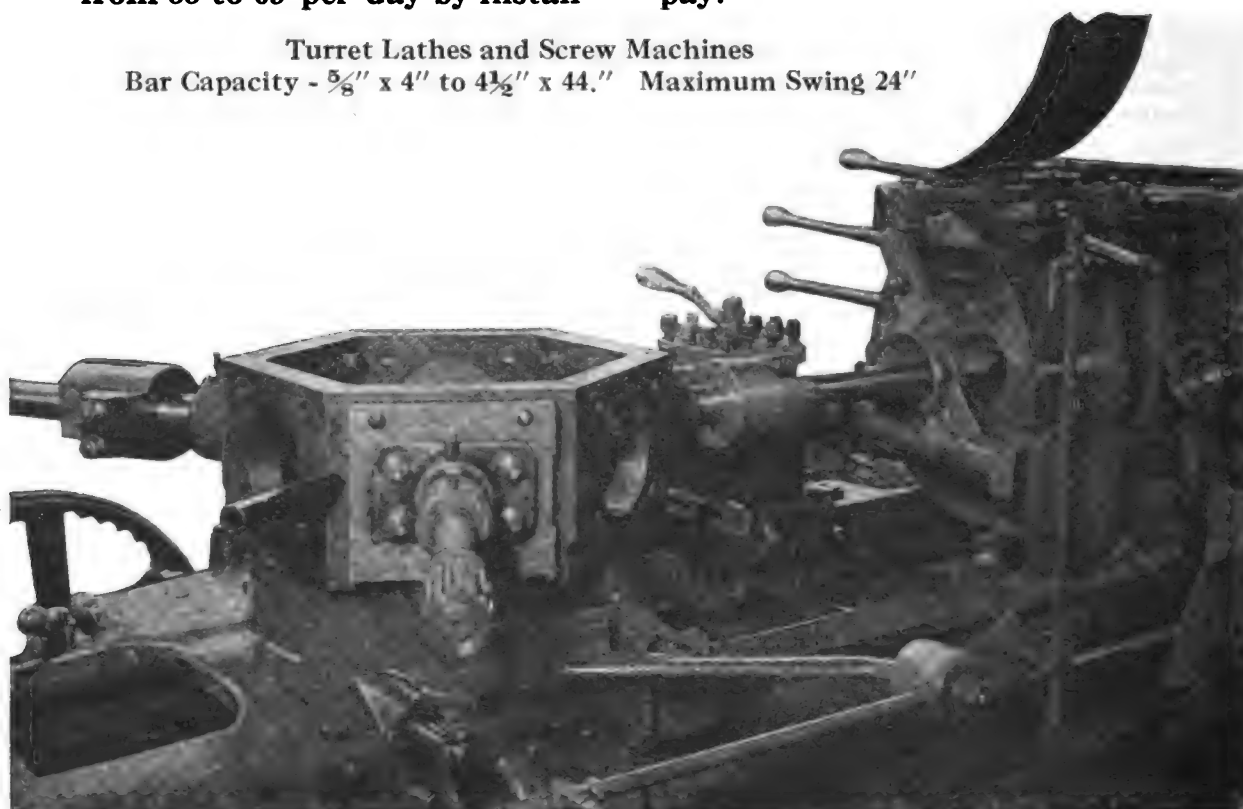
It makes you feel good to double the production of any piece in your shop. Doesn't it? It means increased profits and getting the work out sooner.

Here is a Middle West automobile builder who increased the production of his steering cases from 33 to 65 per day by install-

ing a Warner & Swasey turret lathe.

If you want to increase your production—or if you are expanding your plant or building a new one—investigate Warner & Swasey Turret Lathes. It will pay.

Turret Lathes and Screw Machines
Bar Capacity - $\frac{5}{8}$ " x 4" to $4\frac{1}{2}$ " x 44." Maximum Swing 24"



The Warner & Swasey Company CLEVELAND, OHIO, U. S. A.

NEW YORK OFFICE—Singer Building
DETROIT OFFICE—Ford Building

BOSTON OFFICE—Oliver Building

BUFFALO OFFICE—Iroquois Building

CHICAGO OFFICE AND SHOW ROOM—618-622 Washington Boulevard

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Hallidie Machinery Company, Seattle, Wash.

CANADIAN AGENTS:

A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, Vancouver and St. John's
Williams & Wilson, Ltd., Montreal

USL SERVICE STATIONS



The New
USL DEALER PLAN
offers convenient
battery profits to—
Automobile Dealers
Accessory Dealers
Garage Men . . .



*Storage Battery Service & Sales Co.,
Memphis, Tennessee
One of the chain of nation-wide
USL Service Stations.*

All motoring people need battery and electrical service—all need new batteries *sometime*. The convenience of our Plan for you lies in the fact that you are meeting these people right along and that occasions will come naturally for you to do them a good turn by selling them USL Batteries and USL Service. You can do this without battery-expertness or added overhead.

And the vital thing needed to keep your patrons "battery-happy"—expert service—will be faithfully supplied by your USL Service Station.

Better "get a line" on the handy battery-dollars that ought to be yours, by a talk with the USL Service Station in your town, or write for our "New USL Dealer Plan."

U. S. Light and Heat Corporation, Niagara Falls, N. Y.

USL
TRADE MARK
U. S. LIGHT & HEAT CORPORATION

FREE Our 50-cent Battery Book that answers every battery question. It's a book of interest and value to every man in the automobile business.

storage
batteries



Leading Automobile Manufacturers

are using "Twenty-Four Hour Daylight" in their Plants

Night shift production with day shift efficiency can be secured only under the best conditions of illumination. Even distribution, absence of heavy shadows, freedom from glare—those are the characteristics of

Cooper Hewitt Light

which has earned it the designation "Better than Daylight." Under this light workmen feel no eye-strain and they can see the finest details of the work with perfect ease.

Because of its perfect diffusion, absence of glare and substantial economy, Cooper Hewitt light is ideal for almost any industrial establishment. Most of the prominent makes of automobiles are now manufactured under Cooper Hewitt light.

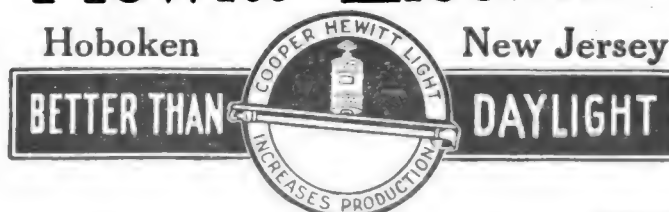
Our specialists will help you plan an efficient lighting system for your plant. Address our nearest office.

Cooper Hewitt Electric Company

Hoboken

New Jersey

General Offices:
95 River Street



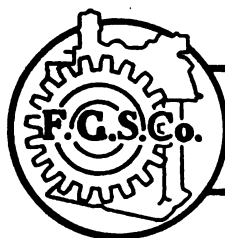
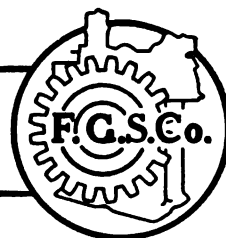
Works:
Eighth and Grand Sts.

Boston—161 Summer Street
Chicago—215 Fisher Building
Cincinnati—First National Bank Bldg
Cleveland—Engineers' Building

Detroit—Ford Building
Los Angeles—Keece Engineering Corp.
Milwaukee—Security Building

Philadelphia—Drexel Building
Pittsburgh—Westinghouse Building
St. Louis—Central National Bank Bldg.
Syracuse—University Building

CH-25

**SERVICE, ACCURACY, PRODUCTION**

The Machine Which Has Revolutionized Gear Cutting

Books were once so rare that only the very wealthy could own them.

Gutenberg's invention of the printing press, somewhere around 1450, revolutionized this condition. Books then came within the reach of everybody; education spread and civilization advanced.

So with gears—accurate gears.

Their manufacture was a thing of infinite pains, of utter dependability upon the skill of the workman, the sureness of his hand and infallibility of his eye.

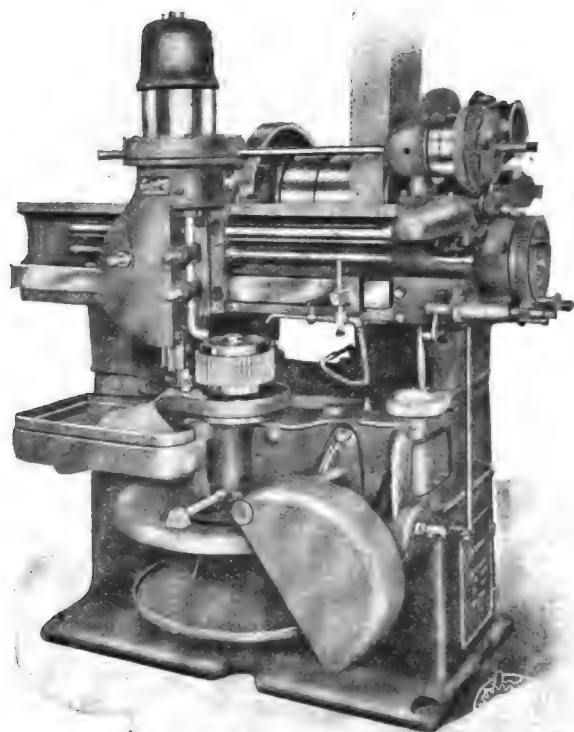
Then came the Fellows Gear Shaper and the Gear Shaper Cutter.

Accurate gears in commercial quantities were placed within the reach of every manufacturer.

You may ask how this machine can justify such claims.

There are several reasons why these claims are justified: First, because the Fellows Gear Shaper Cutter is a generated cutter. It is ground all over after hardening, including the involute curves on the teeth, which are generated with a precision that is beyond question.

Just three more points: Each Fellows Gear Shaper Cutter is an original cutter. It is not a copied duplicate. Each Fellows Gear Shaper Cutter is inspected after every important operation and receives a final inspection such as no other gear-cutting tool can receive. Each Gear Shaper Cutter operates on the generating principle, producing gears consistently, rapidly and economically.

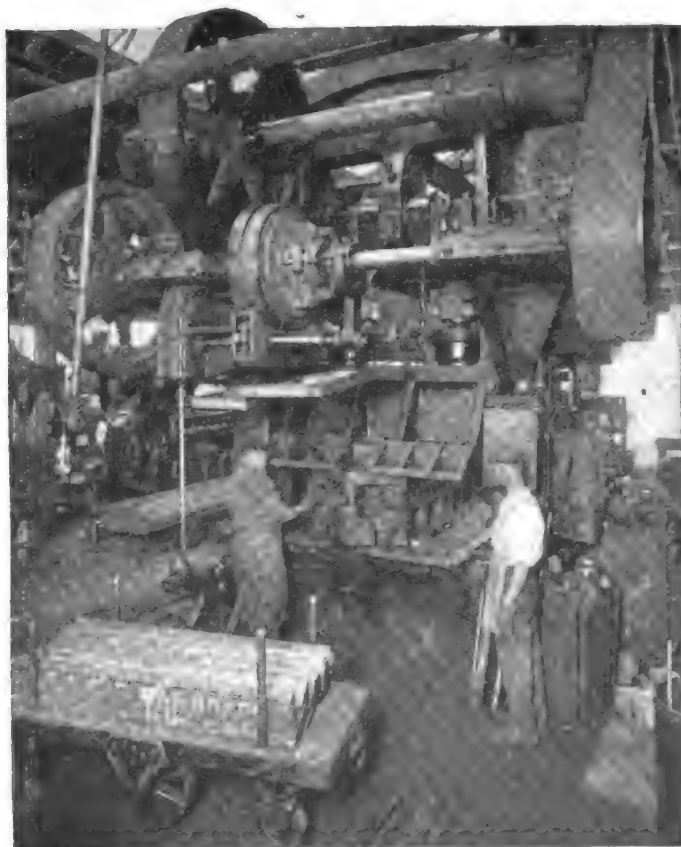


Many other interesting points are explained in our general catalog, "Commercial Gear Cutting," a copy of which we will gladly send to those interested.

THE FELLOWS GEAR SHAPER COMPANY

Springfield, Vermont, U. S. A.

FOREIGN AGENTS: Alfred Herbert, Ltd., Coventry, England; Societe Anonyme Alfred Herbert, Paris, France; Societa Anonima Italiana Alfred Herbert, Milan, Italy; Alfred Herbert, Ltd., Yokohama, Japan; Societe Anonyme Alfred Herbert, Barcelona, Spain; Societe Anonyme Belge Alfred Herbert, Brussels, Belgium; Alfred Herbert, Ltd., Calcutta, India.



Perforating and Riveting—

"BLISS" Presses are used for perforating and riveting frame members in the plant of the Cleveland Tractor Company. The large press in the lower picture is a "BLISS" No. 12, Double-Crank. It perforates rivet-holes in two side-frame plates at each stroke.

In the upper picture is shown a battery of "BLISS" No. 103-A Presses driving and heading $\frac{3}{8}$ " rivets, cold driven, in side-frame.



1857

E. W. Bliss Company

Main Offices: BROOKLYN, N. Y., U. S. A.

American Factories: BROOKLYN, N. Y. and HASTINGS, MICH.

—SALES OFFICES—

CHICAGO, People's Gas Bldg.
CINCINNATI, Union Trust Bldg.

DETROIT, Dime Bank Bldg.
BUFFALO, Marine Bank Bldg.

CLEVELAND, Union Bank Bldg.
St. LOUIS, Boatmen's Bank Bldg.

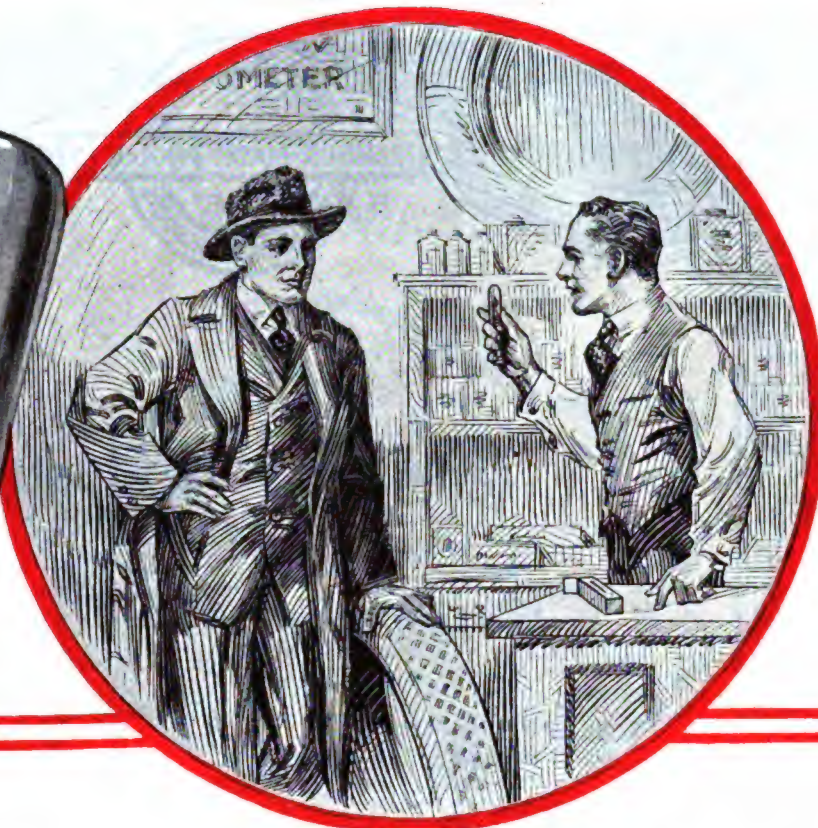
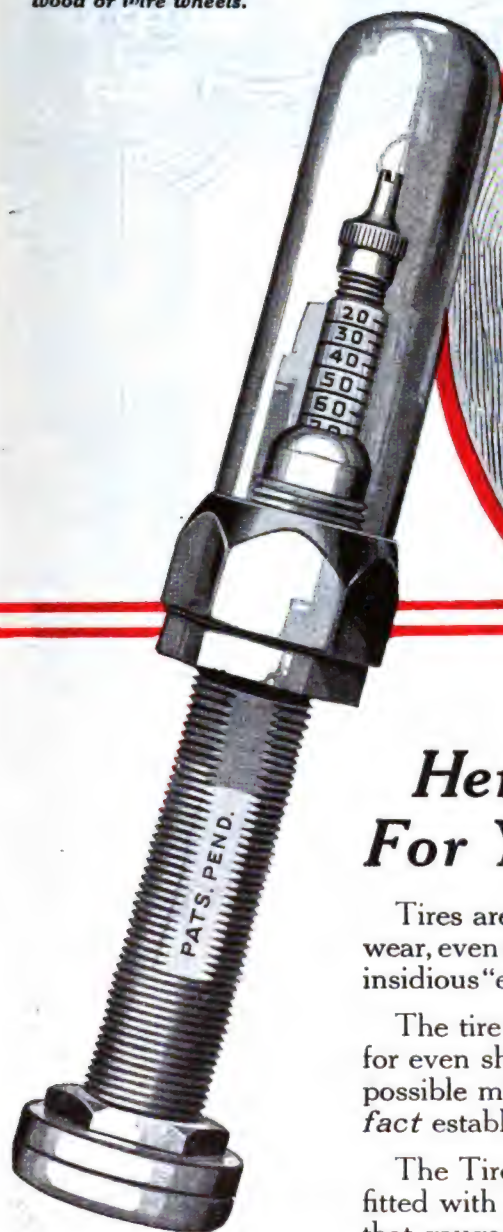
—FOREIGN SALES OFFICES and FACTORIES—



1920

LONDON, ENGLAND, Pocock Street, Blackfriars Road, S. E. PARIS, FRANCE, 100 Boulevard Victor-Hugo, St. Ouen

Price in U. S. — \$1.75 each or \$8.00 the set of five. In ordering, specify wood or wire wheels.



Here are 2,000 Extra Miles For Your Tires—Perhaps More

Tires are built to withstand the grind and shocks of ordinary road wear, even the effects of sudden "down brakes" and skidding. It is the insidious "enemy within"—under-inflation—that saps the life of the tire.

The tire built for 80 lbs. pressure is permanently injured if run for even short periods at 60 lbs. Under-inflation steals $\frac{1}{3}$ of the possible mileage of the average tire. This is not our *theory*. It is a *fact* established by the experience of tire manufacturers themselves.

The Tirometer is a mechanically correct non-leaking valve stem, fitted with a pressure gauge and a transparent cap which makes that gauge instantly readable.

Not one motorist in a thousand takes his tire pressure at frequent enough intervals. Nor can one blame him. Taking the pressure of four or five tires with the ordinary gauge is a dirty and tedious process. With the Tirometer a glance at the tire pressure becomes as much a matter of course as the consultation of the gauge on the gas tank before each trip.

The retail price of each Tirometer is \$1.75. A couple of thousand tire-miles at that price is a good buy. The Tirometer is quickly installed on any inner tube, and may be as easily changed to a new tube when the old one wears out.

The Tirometer is not a novelty. It is a coming PART of every automobile. It is not a luxury or a fad, but a necessity. A consistent advertising campaign is now running in the Saturday Evening Post and other magazines. Write for the attractive dealer's proposition.

Tirometer Valve Corporation of America

Charleston, W. Va.





The Clock Industry and *"Barnes-Made"* Springs

This Company originally made clock springs exclusively. And Wallace Barnes conceived and patented the original clock spring loop to-day in universal use.

Changing requirements and later inventions have put new demands upon the resources of our engineers and designers. These demands have been met, and increased production and additional equipment have always been ready when needed.

"Barnes-Made" Springs have developed with the growth of the clock industry in America.

The Wallace Barnes Company

"Spring Makers for Three Generations"

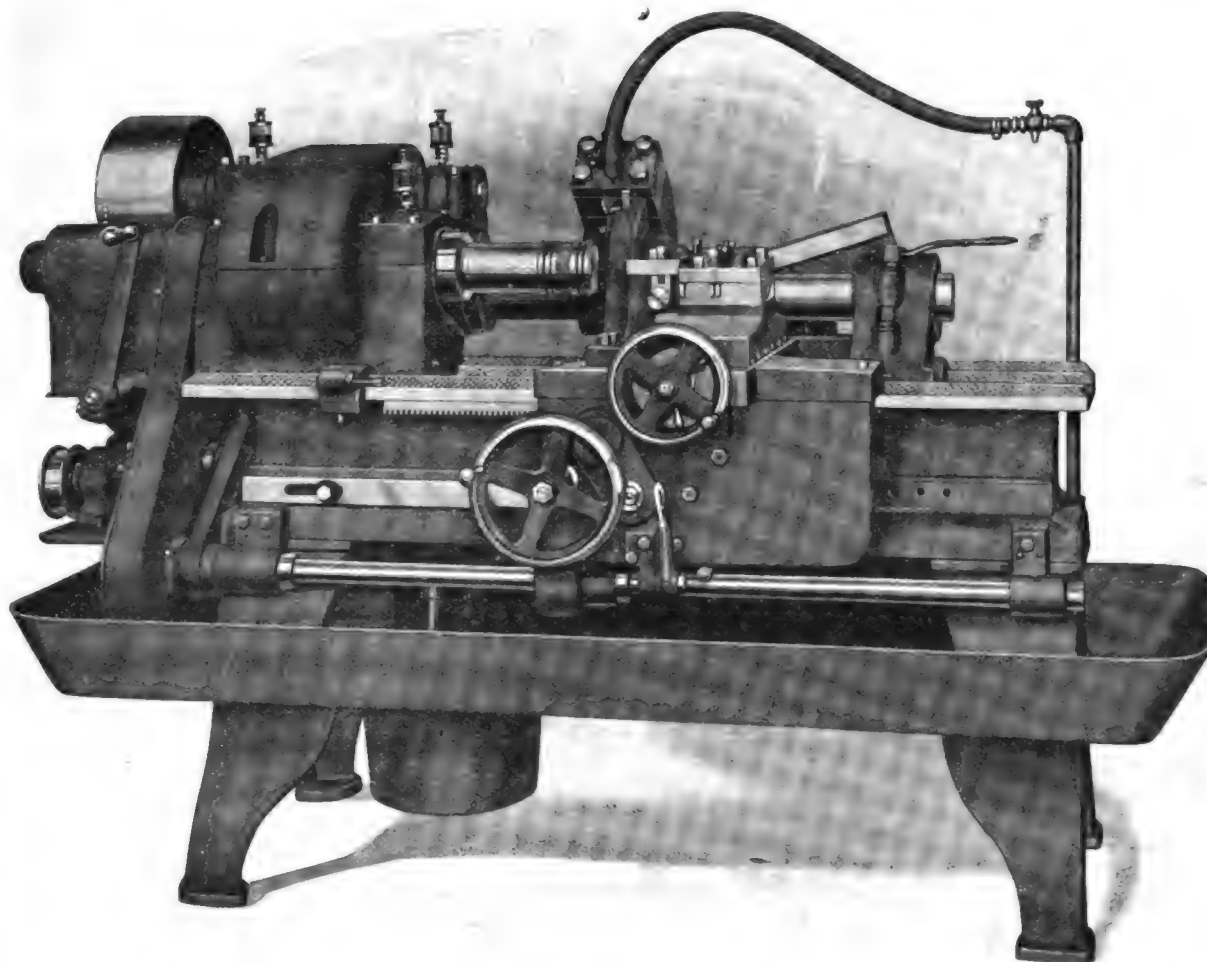
Main Office and Works - Bristol, Conn.

New York Sales Division, 50 East 42nd Street

Western Sales Division, Book Bldg., Detroit.

REED-PRENTICE COMPANY

WORCESTER  MASS. U.S.A.



“ S P E E D ”

This Reed-Prentice Automatic rough turns, grooves, bevels and faces a three and three-quarter inch piston in one minute thirty-five seconds, floor to floor.

The piston casting is mounted on the extended spindle and held by a false wrist pin with a draw-in mechanism.

The machine is then started and two opposed roughing cut tools mounted in a C block begin their turning cut, directly following is a semi-finishing turning tool. When the cuts are complete the carriage stops positively. The operator then by the quick feed hand wheel runs the accurately spaced ring - grooving tools into

the work until the cross - slide meets a stop.

While these operations are progressing the back arm tools (consisting of a facing and beveling tool) are being fed into the work by a heavy cam mechanism inter-connected with the carriage.

By using this method of roughing out pistons breakage has been eliminated and tool chatter is unknown.

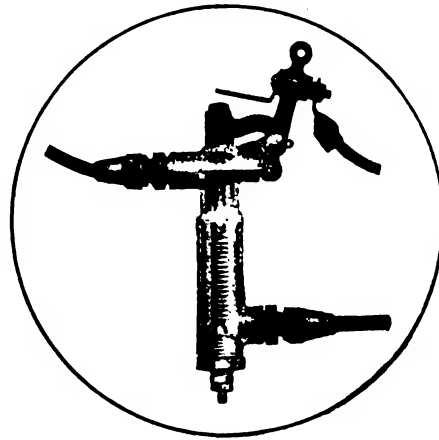
The finishing operations have been shown in past issues of this journal.

We respectfully request that these Reed-Prentice Multiple Operation Lathes receive your serious consideration.

REED-PRENTICE CO.
Export Office—24 Stone St., N. Y.

MANNING, MAXWELL & MOORE, INC.
Fenwick Freres
Canadian Fairbanks-Morse Co., Ltd.

REED-PRENTICE CO.
Detroit Office—Majestic Bldg.



A Primer, but not a Primer—

It is more than a mere priming device. It goes a step further. An electrically heated coil transforms the liquid fuel almost instantly into vapor. Then into the cylinders—a rich, hot mixture—so near the exploding point that ignition takes place as soon as the engine is turned over.

Car manufacturers who appreciate the selling value of those mechanical requirements so essential to all year-round driving have adopted the Master Electrical Primer as standard equipment. You find the Franklin, National and Cunningham cars so equipped.

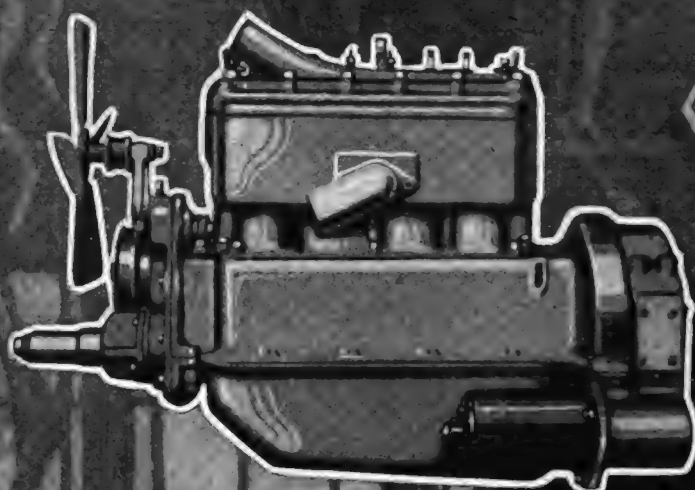
Master Primer Company

34 E. Larned Street Detroit, Michigan

Master

ELECTRICAL PRIMER

Standard Equipment on Quality Cars



WHEN YOU GET DOWN
TO FUNDAMENTALS THE
METAL IS THE ENGINE

IN speaking of the Lycoming Motor we begin with metal. It is the metal that determines an engine's ability to stand up under service. The metals we put into the Lycoming Motor are a big factor in making possible the endurance and reliability which have won them so high a reputation with car builders and motorists throughout America.

LYCOMING FOUNDRY
& MACHINE CO.

Williamstown
Penna. U.S.A.



LYCOMING MOTORS



A rough idea of a smooth thread

Here's a bolt—shown as large as the page permits, but only half its actual size—that will give you an idea how H & G dieheads handle large work.

The thread is accurate in depth, pitch, length and lead; perfectly straight and true to micrometer measurements. The second cut chases the first without the slightest variation. The thread is beautiful; looks as though it were ground.

Hundreds of bolts like this are threaded every day in faster time, and in a better manner, and with more all-around satisfaction with H & G dieheads. Smooth, accurate threads from this size all the way down to tiny clock screws are cut with H & G dieheads, automatically, economically, evidently satisfactorily.

You can secure equally good results. How, why and wherefore is told in our new 96-page catalogue. This book is a real contribution to the science of thread-cutting and should be in the hands of every man in the business.

A post card or letter will bring a copy to you with our compliments.

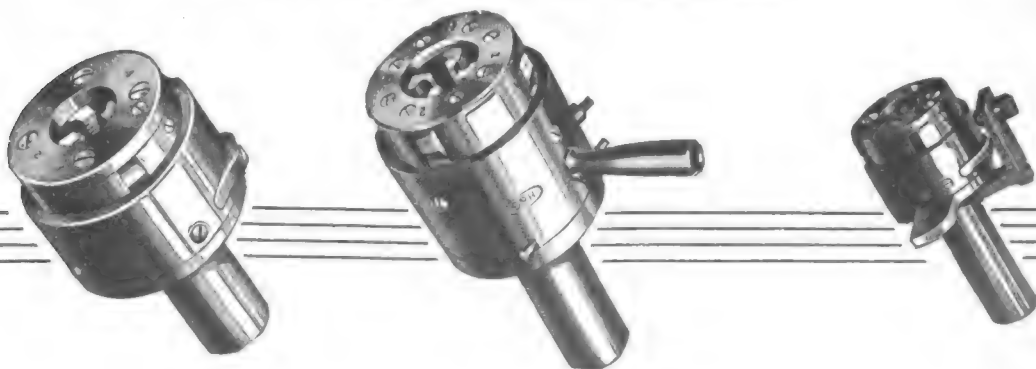
H & G Dieheads are made in three standard styles, and each style in several sizes. They are adaptable to practically all machines on which threading is done.

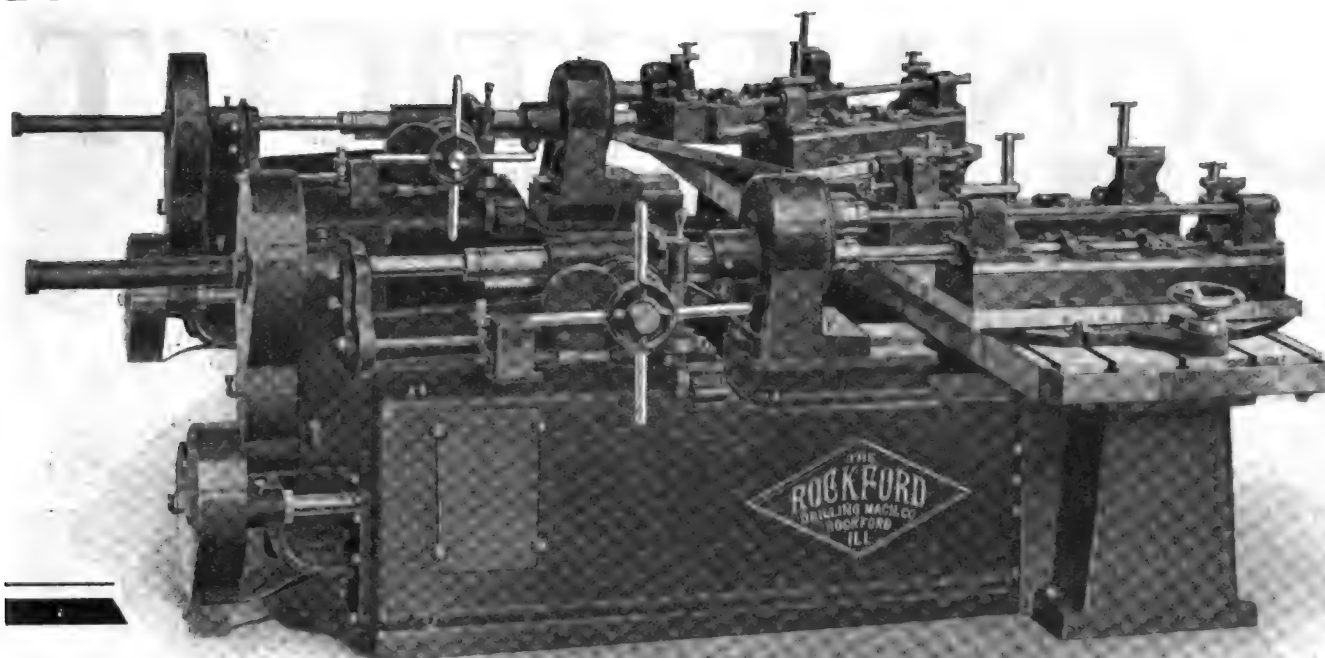
Style A—is for automatics like the Cone, Gridley, National Acme threading machines and bolt cutters, in which the diehead rotates.

Style C—is for turret lathes, hand screw machines, and similar machines in which the diehead is held stationary.

Style D—is new and it is a masterpiece. It is especially designed for Brown & Sharpe automatics, but can be used on other machines cutting small work.

H & G Works—The Eastern Machine Screw Corporation
22-42 Barclay Street, New Haven, Conn.





Chevrolet Production Is Kept Up With Rockford Machines



The above pictured Rockford Heavy Duty Horizontal Boring and Drilling Machine is boring Crank and Cam Shaft holes at one operation in Chevrolet Model F Cylinders.

This work is illustrative of the many machining operations in automotive manufacture that are possible with Rockford Drilling Machines.

Rockford Heavy Duty Horizontal Boring and Drilling Machines are especially adapted for repetition work on automotive work such as mentioned above, as well as crank and transmission cases.

They are on duty in many large shops, making possible the maintenance of production schedules which would otherwise be demoralized for lack of competent labor—or high prices for labor, when available.

These machines readily lend themselves to application of multiple drive heads for boring two to ten holes at one time. Two or more pieces of work can be handled at one time, saving floor space and operators.

Investigate this highly efficient line of production units. Put your problem up to us for solution. We have the benefit of wide experience in many shops, and may be able to save you much time and money.

Illustrated Literature sent upon request.

ROCKFORD DRILLING MACHINE CO.
ROCKFORD, ILLINOIS

E. L. Essley Machinery Co., 552 Washington Blvd., Chicago, Ill.; Marshall & Husehart Machinery Co., 334 North Capitol Ave., Indianapolis, Ind.; Marshall & Husehart Machinery Co., 905 Chemical Bldg., St. Louis, Mo.; Henry Prentiss & Co., Inc., Singer Bldg., New York City, N. Y.; Henry Prentiss & Co., Inc., 724 Prescott Ave., Scranton, Pa.; Herberts Machinery & Supply Co., 405 E. Third St., Los Angeles, Calif.; Henry Prentiss & Co., Inc., 607 D. S. Morgan Bldg., Buffalo, N. Y.; Henry Prentiss & Co., Inc., 49 Federal Street, Boston, Mass.; Henry Prentiss & Co., Inc., 520 Uni-

versity Block, Syracuse, N. Y.; Henry Prentiss & Co., Inc., 315 E. & B. Bldg., Rochester, N. Y.; Somers, Fittler & Todd Co., 323 Water Street, Pittsburgh, Pa.; Monarch Machinery Co., 300 Third Street, Philadelphia, Pa.; Strong, Carlisle & Hammond Co., 270 Jefferson Ave., Detroit, Mich.; Strong, Carlisle & Hammond Co., 326 Frankfort Ave., N. W., Cleveland, Ohio; Herberts Machinery Co., 168 Second Street, San Francisco, Calif.
Foreign Representative: Burton, Griffiths & Co., London.

CONNECTICUT

IGNITION



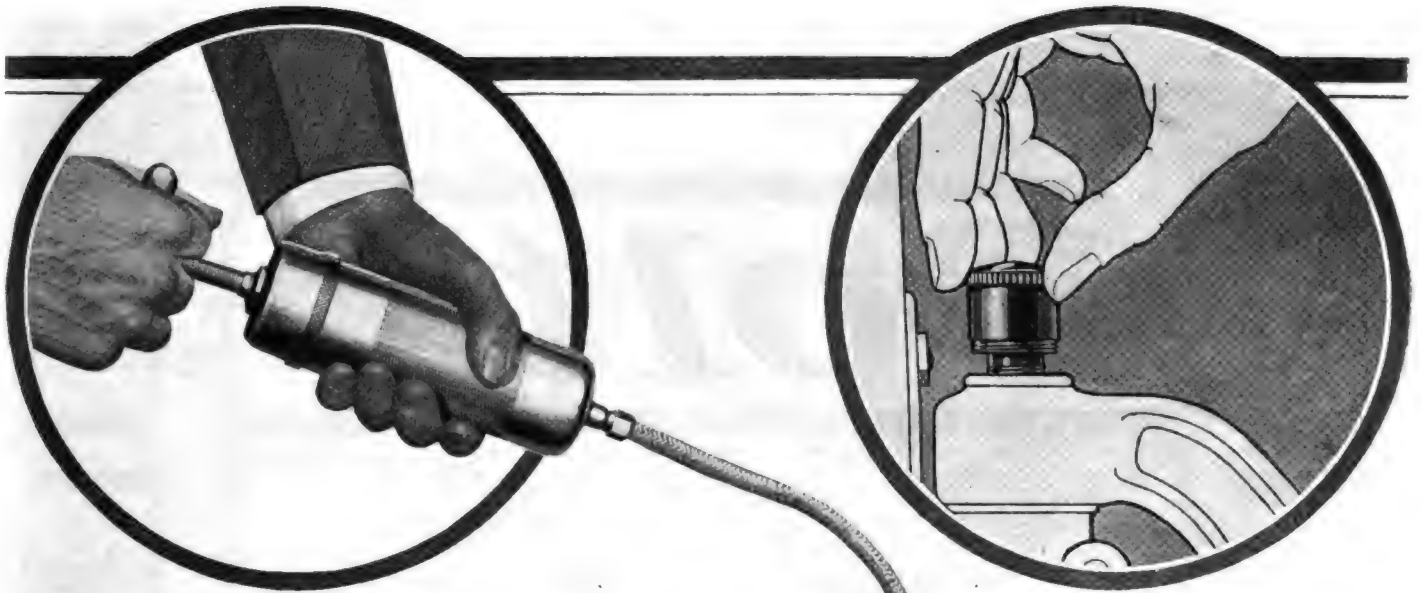
The New
Connecticut
Toggle Switch

JUST WHEN YOU NEED IT MOST!

IN "JERKY" going—where you slow down for rough spots or for puddles and start up again for smooth stretches, first one thing, then another, mile after mile—there's a demand for power that can be answered satisfactorily *only* by Connecticut Ignition. In a system which depends for an efficient spark on the speed of the motor, the current weakens when the engine "slows"—but in Connecticut Ignition the flow of current is at all times *unrestricted*—continuously giving that fat, intense spark which is a vital necessity. When no current is needed, then, and in no other system, Connecticut Ignition's automatic switch shuts it off *completely*.

Find out about Connecticut Ignition—it's worth your while!

CONNECTICUT TELEPHONE & ELECTRIC COMPANY
Meriden Connecticut



Compare the Two Methods It's A Matter of Leverage

With the Alemite High Pressure Lubricating System a few turns of the wrist force grease to the bearing surfaces under high pressure—500 lbs. to the square inch if necessary. This cannot be accomplished with the finger operated grease cup because the necessary leverage cannot be secured.

The high pressure reached with the Alemite System forces out the old grease with its accumulated dirt and grit and cushions the new grease around the bearing surfaces. Perfectly efficient lubrication is the result.

Ball check valve nipples are screwed in at the various lubricating points on the chassis instead of the ordinary grease cups.

With an Alemite System the operation of lubricating becomes clean and positive.

The services of our lubricating engineer are at the disposal of manufacturers and engineers.

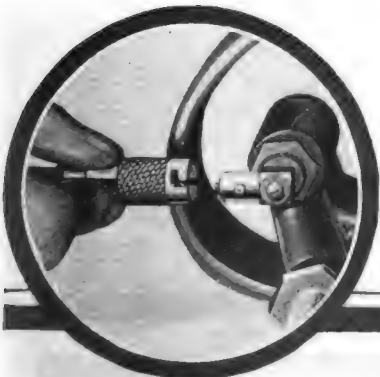


THE BASSICK MANUFACTURING CO.

361 W. Superior St.

Chicago, U. S. A.

HIGH PRESSURE
ALEMITE
LUBRICATING SYSTEM





Bolts

HARDENED AND GROUND

Where Do You Place Your Medium Sized Orders?

If you have been depending upon the Quantity Producers for your small orders, you will appreciate the service a "Small Order" organization can give you.

We are large producers of small quantities.

We specialize on the "10,000 limit" orders.

If your requirements come within those limits—if you have realized the many advantages of maintaining your bolt stock by small orders—write us today.

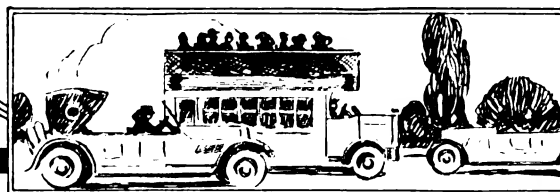
Your samples or blue prints will receive prompt attention.

THE FORD CLARK COMPANY

"Large Producers of Small Quantities"

3125 Perkins Ave.,

Cleveland, O.



©
STAFF



80,000 Wire Wheel Hub Caps Are Cast of Alwite

PARTS cast of Alwite are beautiful and beauty is the wire wheel's strongest selling feature.

Alwite takes on the appearance of highly polished nickel plating by mere buffing. And you can keep an Alwite casting polished bright without fear of wearing off a plating and exposing a brass base.

Alwite alloy is white all the way through. It does not depend on any sort of plating for its finish.

It will not rust, stain or corrode.

Not only do we cast hub caps of this new alloy, but radiator caps, door handles, interior trims, window regulator handles—any part that appears best with a finish like nickel plate. We make prompt deliveries of such parts.

Send for sample part cast of Alwite—as this superior alloy costs no more than brass, you will be interested in our price quotations.

Cochrane Brass Foundry Co.
York Penna

Western Sales Branch

MILLER CAVE CORP., 122 S. Michigan Ave., CHICAGO, ILL.

*We also cast automotive parts of Brass, Bronze, Copper, Gray Iron, Aluminum.
Let us quote on your requirements.*

Alwite Is

Non-corrosive

Solid White color all the way through.

Polishes like Nickel Plate.

*High tensile strength—
30,000 lbs. upward.*

Machines easily.

Costs the same as Brass Castings.

Cochrane ALWITE

REGISTERED U.S. PAT. OFF.

Metal Castings

Detroit

STEEL CASTINGS

Some idea of the experience behind the production of every steel casting bearing the "Triangle D" brand, can be gained when we say—"since '88."

Both the Converter and Open Hearth Processes used.

Steel Castings from two ounces to twenty-one tons.

**DETROIT STEEL
CASTING CO.**

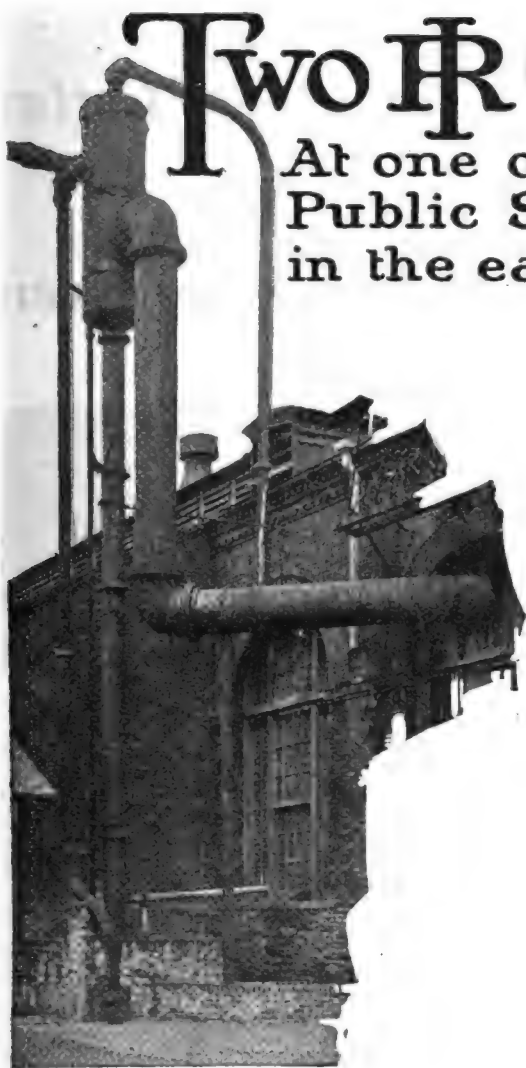
DETROIT

MICH.



Two IR Condensers

At one of the Best Known
Public Service Corporations
in the eastern states.



The public must be served to its full satisfaction. It will not tolerate interrupted service due to failures of equipment at the central station. For this reason, the engineer buys carefully, makes his choice on assurance of dependability, while at the same time insisting on higher efficiency.

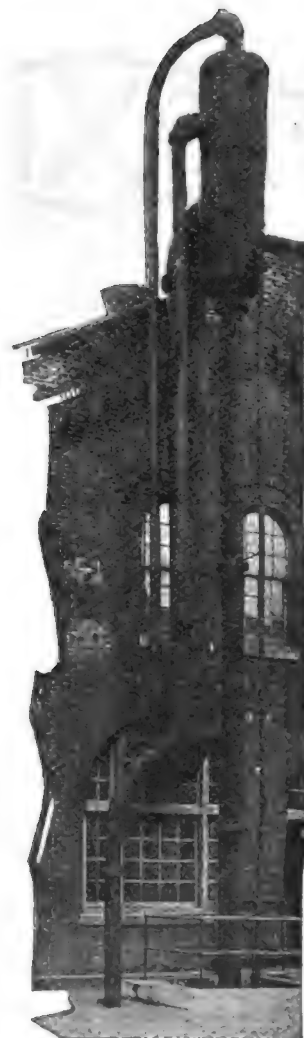
There are many Ingersoll-Rand Condensing Plants serving public utility corporations. The two shown here, at different plants of one company, handle the exhaust steam from turbines and are rated to maintain 28 in. vacuum with 70-degree cooling water.

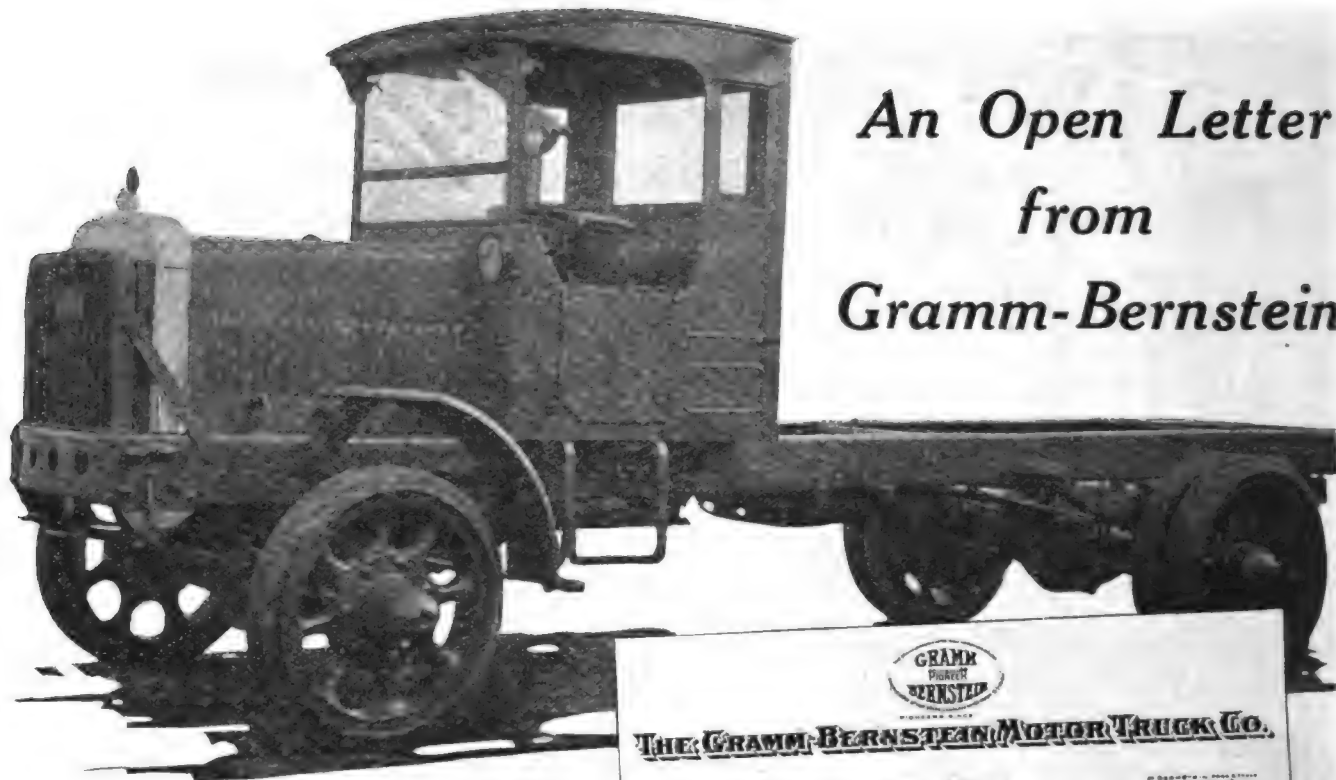
The Company builds complete condensing plants for all service conditions.

Ask for Bulletin 9124

INGERSOLL-RAND COMPANY

11 Broadway, New York
Offices Everywhere





An Open Letter from Gramm-Bernstein

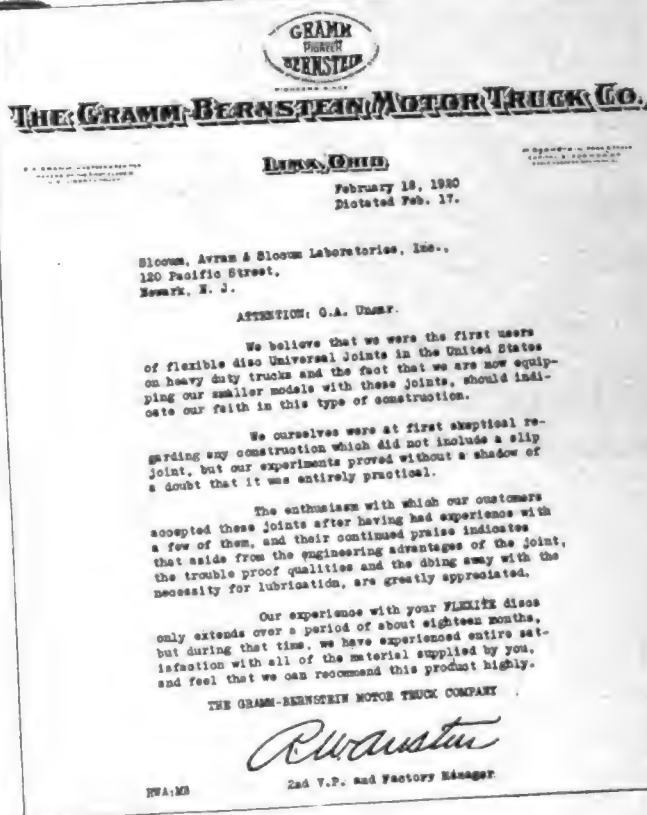
5-ton Grammm-Bernstein Truck Equipped With
Flexite Patented Heavy Duty Universal Joints

FLEXITE

TRADE MARK REGISTERED

One of the First Users of Flexite Patented
Heavy Duty Universal Joints Standard on
it in all their Models.

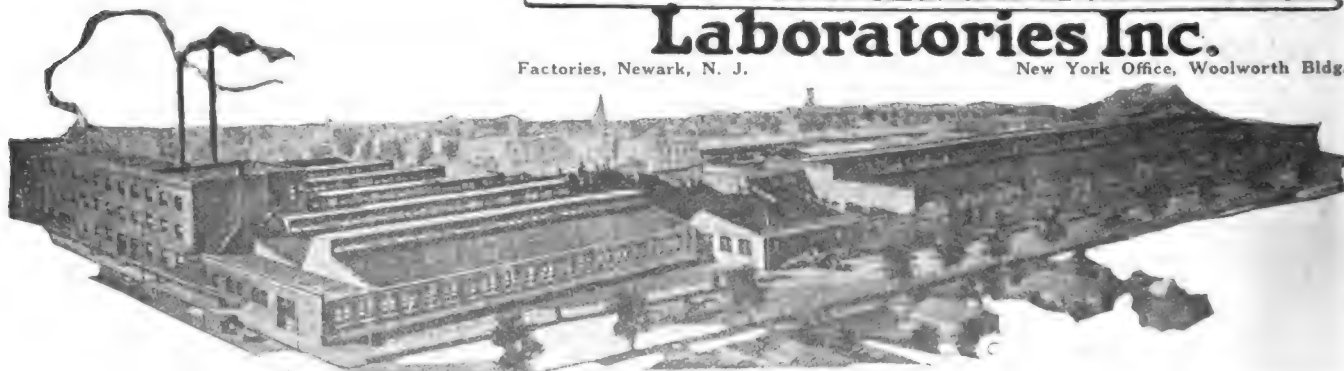
Makers of Flexite Patented Medium Duty
Universal Joints and Flexite Standard
Magneto and Generator Couplings.



Slocum Avram & Slocum Laboratories Inc.

Factories, Newark, N. J.

New York Office, Woolworth Bldg.



Address all Communications to G. A. UNGAR, GENERAL

FLEXITE

SALES AGENT, ROOM 4001, WOOLWORTH BLDG., NEW YORK



Piece workers prefer Little Giants

BECAUSE "they can push them harder and earn more."

Piece workers demand the speediest drill manufactured; the foreman of the assembly shop requires both maximum output and quality work.

Good reasons why Little Giant Air Drills are now standard in hundreds of shops and plants.

Another reason—the toggles of Little Giants are equipped with quickly *renewable* bearings. No need to scrap an entire toggle because of a minor worn part.

Little Giants are ready to stand comparative test in *your* plant and become *your* standard drill. Prompt delivery can be secured from the Company Branches listed below.

Chicago Pneumatic Tool Company

Chicago Pneumatic Building . 6 East 44th Street . New York

Sales and Service Branches all over the World

•BIRMINGHAM •CHICAGO •DETROIT •EL PASO •HOUSTON •JACKSON •LOS ANGELES •MEMPHIS •NEW ORLEANS •NEW YORK •PHILADELPHIA •PITTSBURGH •PORTLAND •RICHMOND •SALT LAKE CITY •SAN FRANCISCO •SEATTLE •ST. LOUIS •TUCSON •BARCELONA •BERLIN •BOMBAY •BRUSSELS •BUENOS AIRES •CAGLE •CHRISTIANIA •FRANKFURT •HAWAII •HONOLULU •JERSEY •LONDON •MADRID •MILAN •MONTREAL •OSAKA •PARIS •REIMS •ST. PETERSBURG •TOKYO •VANCOUVER •WINDSOR

BOYER PNEUMATIC HAMMERS • LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
CHICAGO PNEUMATIC AIR COMPRESSORS • VACUUM PUMPS • PNEUMATIC HOISTS
GIANT OIL AND GAS ENGINES • ROCK DRILLS • COAL DRILLS

LITTLE
Air



GIANT
Drills

A Splitdorf Magneto produces 337 sparks per second!

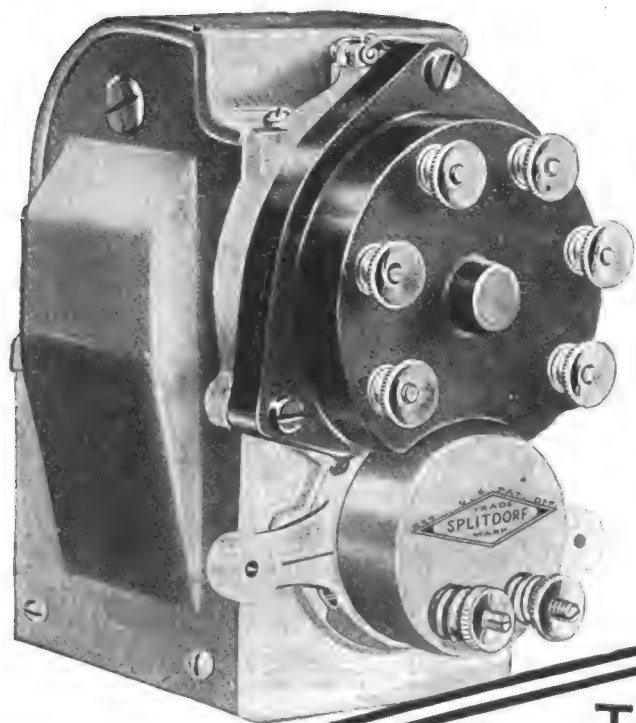
All Splitdorf Magnetos are built on the same plan as the 18-cylinder Splitdorf Magneto—with rotating poles and stationary armature.

The 18-cylinder Splitdorf Magneto is the first magneto of that capacity to enter the automotive field. It is used on an airplane engine with speed of 2250 r.p.m. and is driven at $1\frac{1}{2}$ times that speed or 3375 r.p.m.

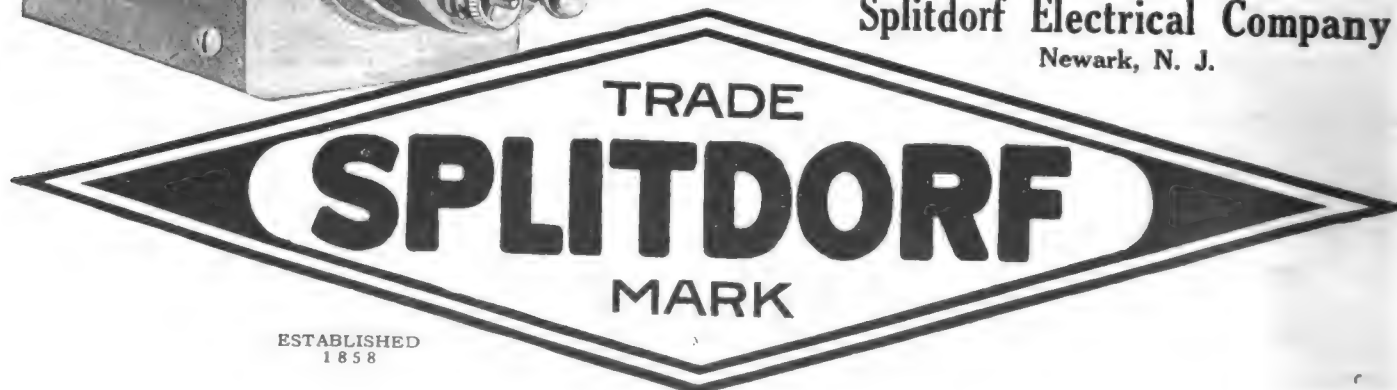
It actually produces 20,250 sparks per minute—6 sparks for every revolution of the magneto shaft!

All standard Splitdorf Magnetos as used in the passenger car, truck and tractor fields, are built of the same materials and with the same accuracy and precision that make the remarkable 18-cylinder airplane magneto possible.

A standard Splitdorf
6 cylinder "Aero" Magneto



Splitdorf Electrical Company
Newark, N. J.



ESTABLISHED
1858

You did it—We told it

Let us keep it up together—

You Did It—you automotive engineers and designers made motoring safe—with your metallurgical research—your well-balanced designs—close-fitting bolts and nuts and powerful engines and brakes.

We Told It—by emphasizing—"Safety" in our national advertising by expressing the confidence that automobile users have in your work.

Let Us Keep It Up—and work together—for "safety"—you have your designing and research work—your special steels and alloys.

We have the tools to cut close fitting screw-threads—The **GTD**

"Gun Tap" which is without equal for the easy tapping of standard metals to close limits—The "Acorn Die" with its precision threading and fast production.



These two **GTD** specialties are the logical tools for "safety" in screw-thread parts. They have the additional merit of reducing overhead expenses by their increased production qualities.

We can send you booklets giving full details as

to our tools on receipt of the signed coupon or a letter under your personal signature giving details of metals to be tapped or threaded.



GREENFIELD
TAP & DIE CORPORATION
Greenfield Massachusetts, U.S.A.
Canadian Plant: Wells Bros. Co. of Canada, Ltd., Galt, Ontario

GTD
Corporation
Greenfield,
Mass.

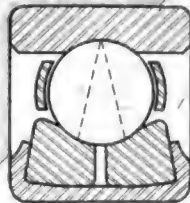
Please send me booklets on "Gun Taps" and "Acorn Dies."

.....
Name of Company

.....
Name of Writer

.....
Address

AI-621



The Keystone Applied

Wherever man has builded, the principle of the keystone is recognized. The Schatz Universal Annular Ball Bearing is its application to a modern problem. The weight of the load is divided and distributed. Crushing, direct-thru-the-center blows are impossible.

Specify the bearing with a margin of safety—Schatz Universal.

THE FEDERAL BEARINGS CO., Inc.

Poughkeepsie, N. Y.

Great Britain: 37 Sheen Road, Richmond, London



*Divided Strains
Increased Capacity*

Schatz UNIVERSAL *Annular* BALL BEARING



Battery of G & E Hobbing Machines Cutting Timing Gears in Willys-Overland Plant, Toronto.

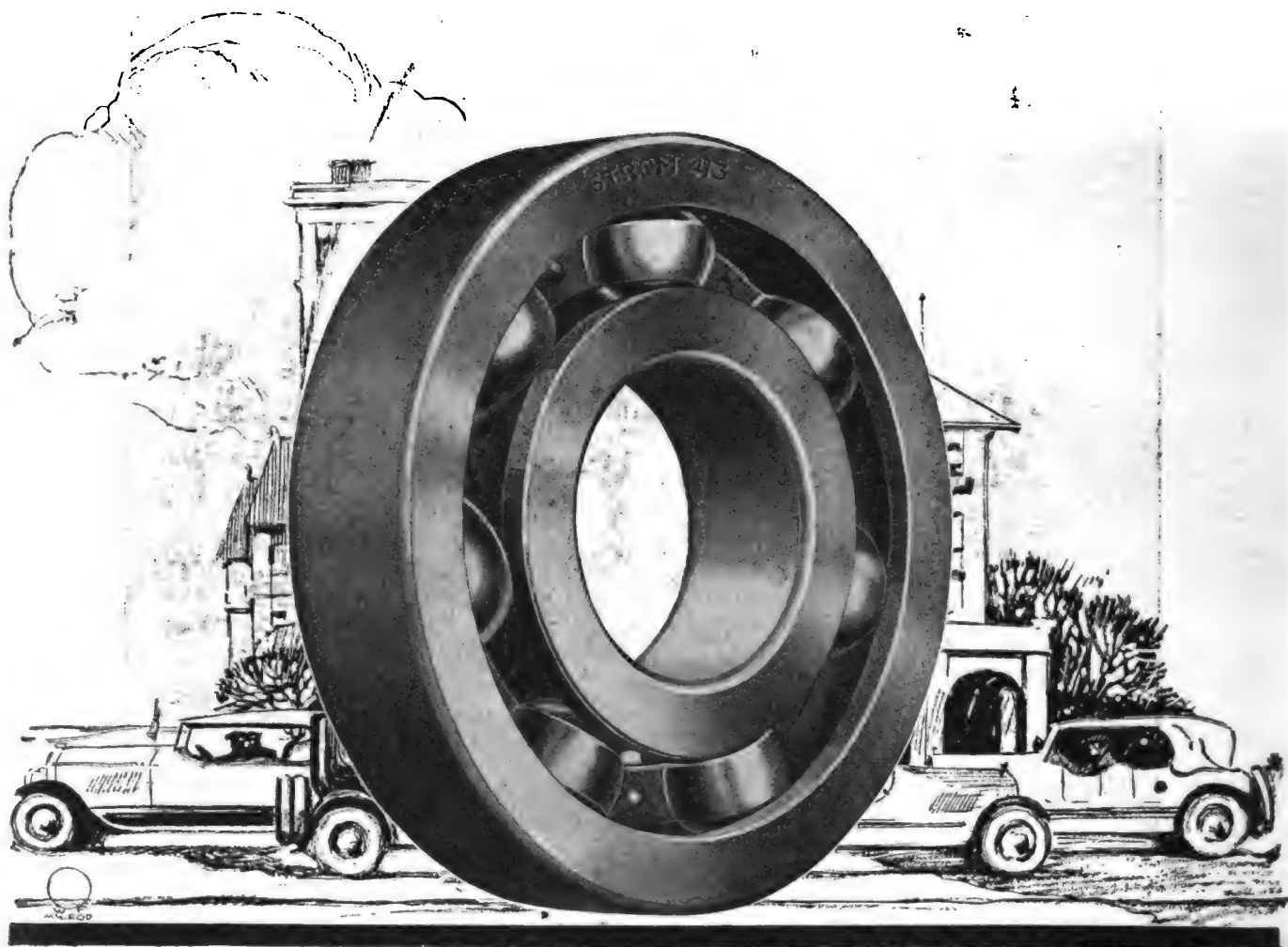
G. & E. Hobbing Machines For the Automobile Shop

OUR No. 18-H Automatic Gear Hobbing Machine is extensively used in automobile shops for the production of spur, helical and worm gears—also worm wheels, clutch discs and splines.

Gould & Eberhardt Hobbing Machines are the choice of the leading gear manufacturers throughout the country. They find them **simple, safe, accurate** and **speedy** in operation.

Write for our Bulletins or—better still—send us your blue-prints of any particular work and our Engineering Department will gladly give you recommendations.

GOULD & EBERHARDT
"HIGH DUTY" SHAPERS
AUTOMATIC GEAR AND RACK CUTTING MACHINERY
ESTABLISHED 1833 NEWARK, N.J. U.S.A.



Strom Bearings Save Oil in Motor Cars

Strom ball bearings in motor cars reduce friction to a minimum. This results in easier, smoother operation, which reduces the amount of oil required.

These bearings are made of the best quality of materials, heat-treated by the most modern, approved methods.

There is a Strom bearing for every use in passenger cars, trucks, tractors and machine shops—in fact wherever a shaft turns.

Bearing installation requires a specialized knowledge. Strom bearing engineers are at your service to help solve your bearing problem.

U. S. BALL BEARING MFG. COMPANY
(Conrad Patent Licensee)

4535 Palmer Street

Chicago, Ill.

Strom

BEARINGS


March 4, 1920

AUTOMOTIVE INDUSTRIES
THE AUTOMOBILE

81

Rivett Quality

"A time-proved quality that extends to every part of every Rivett Product and is reflected in the work they do."



**Northway Motor
Hardened Steel Valve Rolls**

Rivett Service

"A never-ending service in promptly supplying repair parts and operating assistance when needed insures the profitable performance of Rivett Products from the day they enter your plant."

RIVETT MACHINES ON PRODUCTION WORK

**The Service With
RIVETT PRODUCTS
Insures Service
From Them**

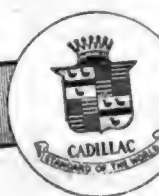
January 15, 1920

AUTOMOTIVE INDUSTRIES
THE AUTOMOBILE

385

Rivett Quality

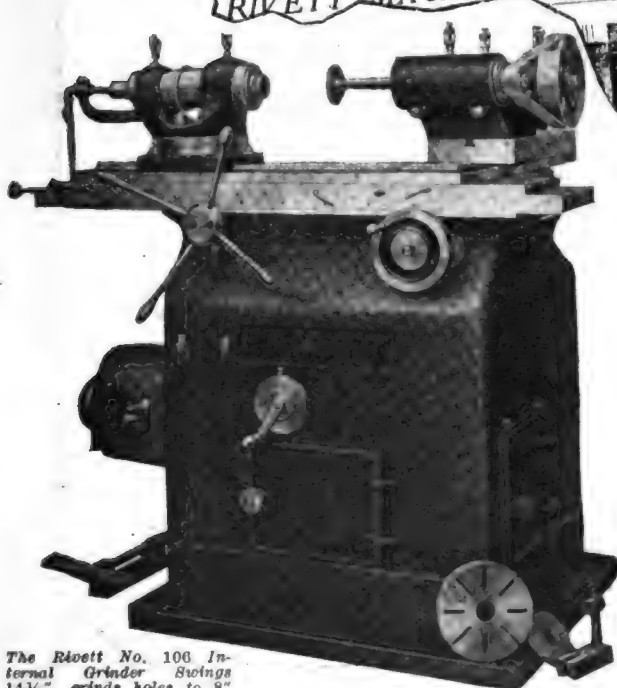
"A time-proved quality that extends to every part of every Rivett Product and is reflected in the work they do."



Rivett Service

"A never-ending service in promptly supplying repair parts and operating assistance when needed, insures the profitable performance of Rivett Products from the day they enter your plant."

RIVETT MACHINES IN AUTOMOTIVE TOOLROOMS



The Rivett No. 100 Internal Grinder Swings 14 1/2", grinds holes to 8" diameter and 8" deep.

Rivett Service

"A never-ending service in promptly supplying repair parts and operating assistance when needed, insures the profitable performance of Rivett Products from the day they enter your plant."

THE SERVICE WITH all Rivett Products is just as extensive as you choose to have it. Whether it is the supplying of repair parts promptly or involves the sending of a man to your plant to instruct your operators, Rivett Service is ever-ready to insure service from Rivett Products.

THE SERVICE FROM all Rivett Products is—accuracy in the parts produced and a rate of production in keeping with modern demands. To insure this is the purpose of Rivett Service and of its success we have but to refer to the thousands of Rivett machines doing duty in shops everywhere.

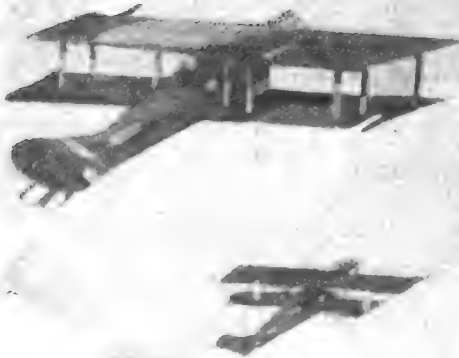
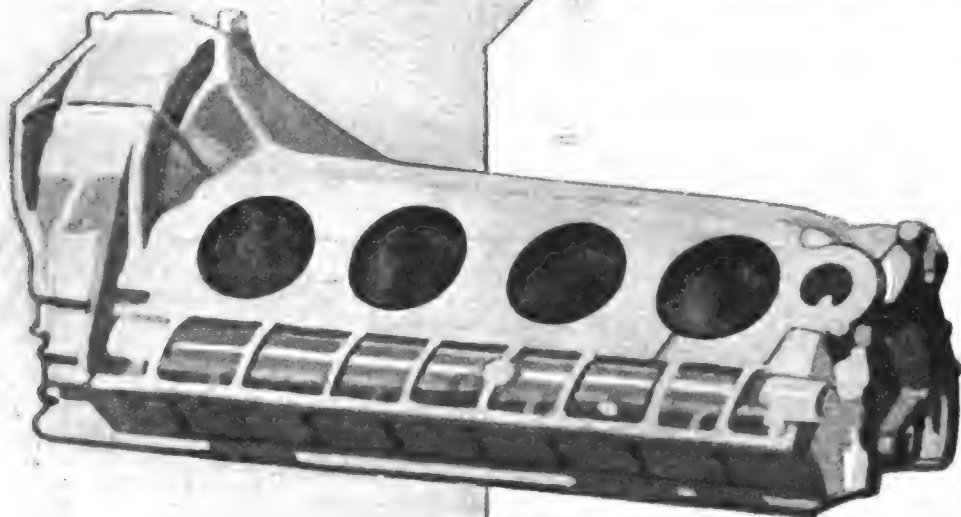
Let our catalog acquaint you with Rivett Grinders and our engineering department with what they will do on your work.

RIVETT LATHE *and* GRINDER COMPANY

BRIGHTON DISTRICT of BOSTON, MASSACHUSETTS
"MAKERS OF THE WORLD-KNOWN RIVETT PRECISION LATHE"

DOMESTIC AGENTS: The Fairbanks Company, Boston, Mass.; Providence, R. I.; Purinton & Smith, Hartford, Conn.; Patterson, Gottfried & Hunter, Inc., New York City; Homer Strong, Rochester, Buffalo, Syracuse and Albany; D. Nast Machy Co., Philadelphia, Pa.; Somers, Fittler & Todd Co., Pittsburgh, Pa.; Cleveland Tool & Supply Co., Cleveland, Ohio; The E. A. Kinsey Co., Cincinnati, Ohio; Indianapolis, Ind.; J. R. Stone Tool & Supply Co., Detroit, Mich.; Dale-Brewster Machinery Co., Chicago, Ill.; Blackman-Hill-McKee Machy Co., St. Louis, Mo.; F. R. Satterlee Co., Minneapolis, Minn.; Halliday Machy Co., Seattle, Wash.; Hendrie & Bolthoff Mfg. & Sup. Co., Denver, Colo.; Portland Machy Co., Portland, Ore.; Smith-Booth-Usher Co., Los Angeles, Cal.; F. O. Stallman Supply Co., San Francisco, Cal. FOREIGN AGENTS: H. W. Petrie, Ltd., Toronto, Canada; Williams & Wilson, Montreal, Canada; Fenwick Freres, Paris, France; Belgium, Switzerland, Italy, Spain, Portugal; Buck & Hickman, Ltd., London, Glasgow, Manchester, Sheffield and Birmingham; A. B. Galco, Ltd., Stockholm, Sweden; Benson Brothers, Sydney, Australia.

ALUMINUM



The manufacturer of motor cars and trucks finds additional evidence of the adaptability of aluminum in the performance of the airplane. Even in the crankcase of the high-powered motors subjected to almost continuous use, aluminum demonstrated the broad uses to which it can safely be applied.

And the automotive manufacturer has yet to exhaust the possibilities of this extraordinary metal.

Aluminum Company
OF AMERICA

PITTSBURGH, PA.

Size---The Only Difference

EMPIRE Bolts and Nuts are made in many sizes and many styles.

But there the variation stops. However tiny or however huge, an Empire Bolt or Nut shows the same qualities of strength, accuracy and finish that have carried the name of Russell, Burdsall & Ward into



every industrial center in the world—and kept it there during 74 long years of unchallenged leadership.

To specify Empire Bolts and Nuts is to remove every element of chance in an important item of assembly.

The company operates three great plants—at Port Chester, Pemberwick and Rock Falls—with an equipment of bolt and nut making machinery having no duplicate in the industry.

RUSSELL, BURDSALL & WARD
BOLT & NUT COMPANY

PEMBERWICK, CONN. PORT CHESTER, NEW YORK ROCK FALLS, ILLINOIS

Makers of Bolts, Nuts and Rivets Since 1875

This Little Safety Sentinel Protects Both Machine and Motor.

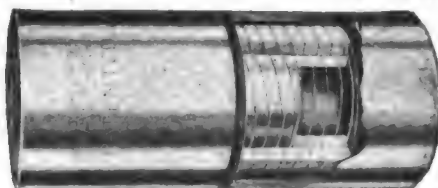
Applied as a regular coupling wherever shafts meet, or just ahead of heavy duty machines, this Karge Coupling serves as a cushion or buffer, easing the power into the machine and lessening the metal-racking shocks and strains to both machine and motor. Absolutely noiseless—100% efficient—requires no lubrication.

In addition to all this the use of these little safety sentinels means a dollars-and-cents saving in power, supplying a flexibility to power drives that makes less power more efficient than the overplus of power required without them.

This full flexibility allows for a maximum 10 degree angle or $\frac{1}{8}$ of an inch offset which automatically compensates for the misalignments of shafting and non-level condition of machines that are bound to occur as foundations settle, etc.

Write today for the detailed Karge story.

KARGE-BAKER CORP.
 Phoenix, New York



ENDORSED BY LEADING ENGINEERS

Karge Flexible Coupling

*Cushions
 the Shock
 of Starting*



Precision Steel

MANUFACTURERS have solved the secret of *reduced weight in steel parts capable of absorbing great strains and stresses* by the use of HESS ELECTRIC STEEL.

The development of the Electric Steel Industry reflects the characteristic technical brilliance of the steel maker in devising a method for the betterment of precision steel that puts the greatest strength into those parts subject to the greatest strain.

HESS COLD MELT ELECTRIC STEEL is preferable for gears, crankshafts, axles, steering knuckles, connecting rods, propeller shafts and springs—because *each bar, each billet is uniform in quality and in freedom from impurities.*

There is a Hess alloy steel that will fit your particular requirements and an opportunity to submit an analysis for your approval will be appreciated.

The Hess Steel Corp.
BALTIMORE MARYLAND



HESS ELECTRIC STEEL

FOR THE VITAL PARTS

Reliable Motor Statistics

Our yearly summaries and monthly reports tell the number of Passenger and Commercial cars registered. They can be secured for individual counties, single states or the entire United States.

Passenger Cars or Trucks

This gives you a complete analysis of any given territory or the country as a whole. By using them you can pick out the strong and the weak places in your organization, keep an accurate check on each dealer, and know whether he is getting his share of the possible business or whether it is going to his competitor.

Mailing Lists

In addition to the statistical service, we are in position to furnish lists of Passenger Car, Ford and Truck Owners according to your own specifications. We have a special list of Truck Fleet Owners in the United States, operating from three to ten or more trucks.

Write Today

for the 1920 edition of our free book of automobile, motor truck and motorcycle statistics. Let our organization of 400 people aid you in making a more intelligent analysis of your markets and your selling problems, as well as relieve you of the burdensome details of your mailing campaigns.

Motor List Company

Martin Tuttle, Proprietor

413 Grand Ave.

Des Moines, Iowa

Chas. G. Tobin, Manager

636 Huron Road

310 Marquette Bldg.

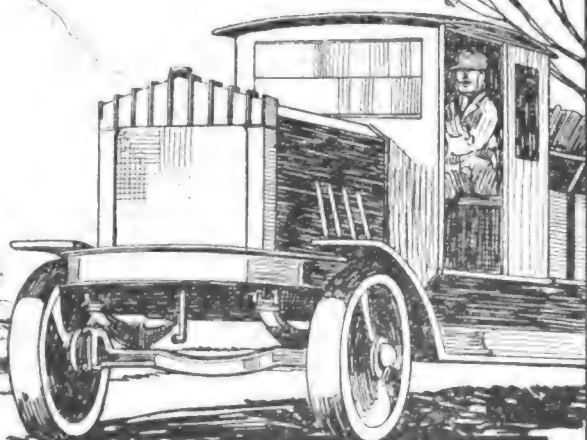
Cleveland, Ohio

Detroit, Mich.

Edw. G. Pratt, Jr., Manager

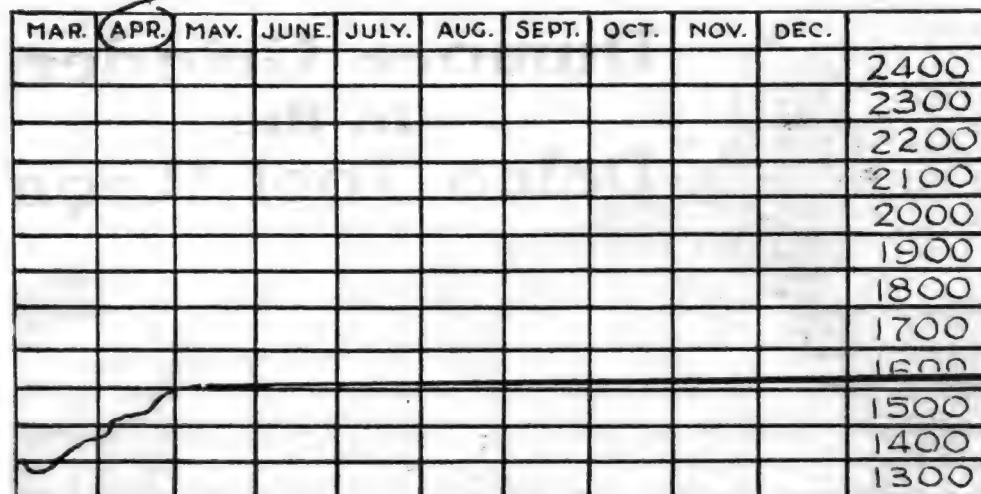
28 Treat Place

Newark, N. J.



To the right is shown a reproduction (reduced) of one of the pages from our five-column county count of Passenger Cars by makes.

STATE Iowa		COUNTY Polk							
PASSENGER CARS	1915 TOTAL	1916		1917		1918		1919	
		Incr.	Total	Incr.	Total	Incr.	Total	Incr.	Total
ADAMS	67		26		29		48		59
ADAMS	2		7		13		22		30
ADAMS	380		457		516		575		634
ADAMS	271		314		364		414		464
ADAMS	19		21		23		25		27
ADAMS	154		161		168		175		182
ADAMS	10		11		12		13		14
ADAMS	15		16		17		18		19
ADAMS	35		36		37		38		39
ADAMS	49		50		51		52		53
ADAMS			7		9		10		11
ADAMS									
ADAMS									
ADAMS	178		185		192		199		206
ADAMS	10		11		12		13		14
ADAMS	10		11		12		13		14
ADAMS	29		30		31		32		33
ADAMS	125		126		127		128		129
ADAMS	106		107		108		109		110
ADAMS	54		55		56		57		58
ADAMS							1		9
ADAMS	20		21		22		23		25
ADAMS	6		17		20		28		31
ADAMS									
ADAMS									
ADAMS									
ADAMS	14		15		16		17		18
ADAMS	4		8		8		9		19
ADAMS	196		272		315		414		426
ADAMS									
ADAMS	40		49		59		59		60
ADAMS	13		27		25		16		19
ADAMS	73		133		144		152		178
ADAMS	13		18		19		24		23
ADAMS	65		100		130		148		223
ADAMS	85		22		102		120		123
ADAMS	117		593		655		702		712
ADAMS	40		41		80		62		78
ADAMS	63		94		108		158		207
ADAMS	20		16		14		15		25
ADAMS	9		13		15		13		13
ADAMS	85		109		109		106		104
ADAMS	21		40		101		102		100
ADAMS			21		21		20		21
ADAMS									
ADAMS									
ADAMS	6		14		19		36		38
ADAMS	205		325		379		370		392
ADAMS	2		2		9		18		15
ADAMS	30		46		63		72		76
ADAMS									
ADAMS	40		60		77		85		103
ADAMS			20		21		25		27
ADAMS	22		23		26		2		7
ADAMS	14		174		170		102		201
ADAMS	745		125		1120		1278		1346
TOTAL	5709		8307		11211		12718		13426



A TILTED ROTARY
INSTALLED APRIL 2



OS. TERLEIN SAYS:

*Watch the Production Curve—It Points the
Way to the Nation's Need, Greater Production*

"When the Tilted Rotary goes in, production goes up, stays up and then jumps up again as more machines follow the first. The increases in production that follow the entry of a Tilted Rotary into a shop are tangible increases, increases that tilt the production curve upward and keep it there. Milling time on job after job is cut from minutes to seconds.

"Watch the Production Curve.
Yours for Production."

The Two Fastest Methods of Duplicate Milling Known Today Are Both Available on The **OHIO TILTED ROTARY**

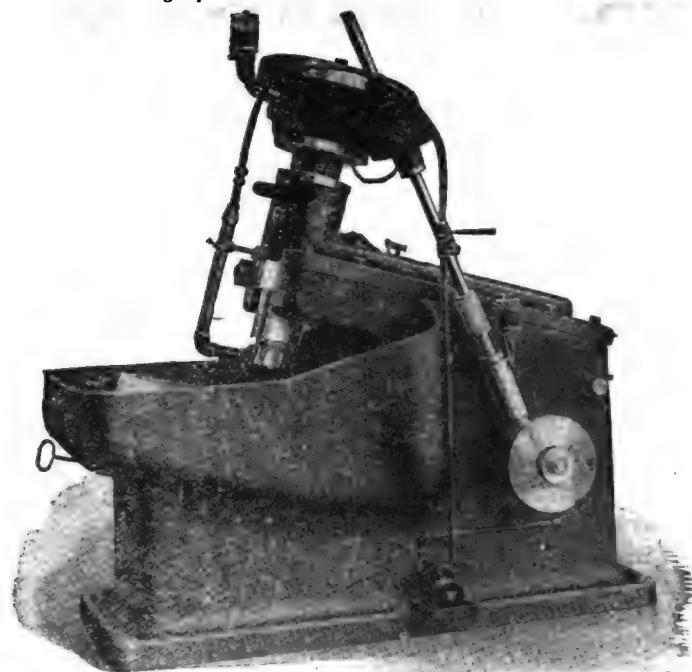
Continuous milling and station milling are the fastest known methods of machining certain types of castings and forgings. On some work the continuous method is by far the faster, on other jobs the station method will far surpass the older method in results.

Both methods are available in this one super-production miller.

Station milling is a recent development and is exclusive with the Tilted Rotary. The principle is simple and obviously advantageous. The circular table has a rotary feed with provision for indexing. Work is held in fixtures which are arranged around the periphery of the table, the number of fixtures being determined by the nature of the work. Each of these fixtures mark a station and the indexing arrangement brings each station to the milling position successively. Table remains stationary while cutter advances, makes the cut and returns to former position, at which time table automatically feeds the next station into position. An automatic fast feed cuts feeding time between stations to the "quick" and cutter is also fast-fed to the work and back to its former position.

Such features as the tilted table and pump which pours 40 gallons of coolant over the cutter per minute are exclusive. The tilting of the table brings the milling position well down under the protecting hood so coolant cannot splash on floor or operator.

Know the whole production-boosting story of the Tilted Rotary. Send for literature today, or better yet, send sample piece of work or blue prints with machining specifications for an actual time study.



OESTERLEIN MACHINE CO.
CINCINNATI, OHIO

MILLERS **OHIO** GRINDERS

"TOOLS IN WHICH EVERY OUNCE WORKS"

OHIO TILTED ROTARY MILLING MACHINE

BUILT BY OESTERLEIN FOR PRODUCTION



Dumore Grinders in the Delco Tool Room

BUSY, EFFICIENT, ADAPTABLE TOOLS

THE Dumore Grinders at the Dayton Electric Laboratory Company (Dayton, Ohio) are continually busy and the Delco tool makers surely like them. The job you see chucked in the heavy lathe is one of a lot of fine counterbores used in the production of distributor cams on Delco ignition sets. Fine limits are fixed on this job and the Dumore as an internal grinding machine has amply proven its dependability for the accurate grinding of duplicate diameters.

This is only one of the many uses made

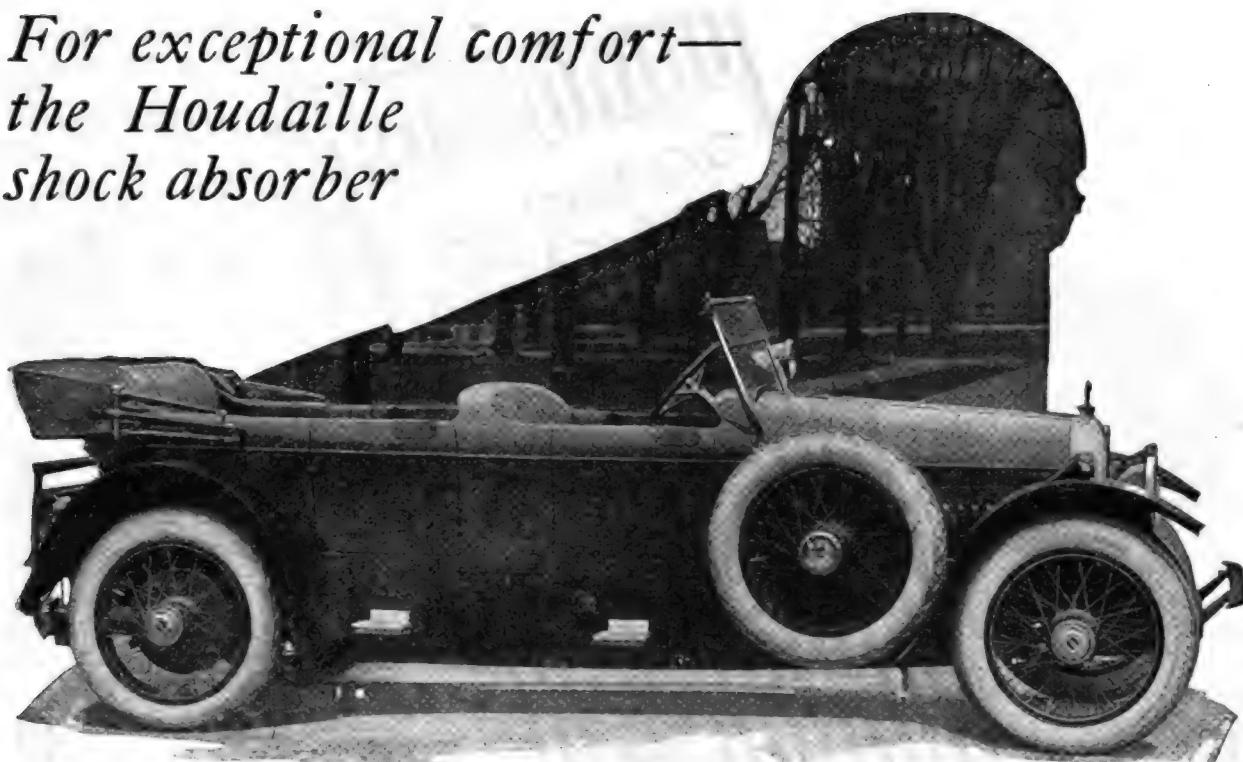
of Dumore Grinders. For all work where speed and production costs are to be considered—where accuracy is of prime importance—and also for the multitude of odd jobs that arise every day — Dumore Grinders are indispensable.

Dynamically balanced, no end play, no vibration. Equipped with S. K. F. and Norma ball bearings. Well built, adaptable, efficient—Dumore Grinders cut costs throughout the shop.

WISCONSIN ELECTRIC COMPANY
6922 Sixteenth Street RACINE, WISCONSIN

DUMORE HIGH SPEED GRINDERS

*For exceptional comfort—
the Houdaille
shock absorber*



1920 Cunningham car equipped with Houdaille shock absorbers

**Among the
Houdaille
standard
equipped
cars are:**

Alba
Alda (F. Charron)
Chenard & Walker
Cunningham
Delage
DeLaunay-Belle-
ville
Farnam
Minerva
Panhard & Levas-
sor
Piccard & Pictet
Peugeot
Renault
Rochet-Schneider
Secqueville &
Hoyau
Unic (Q. Richard)

The Cunningham and many other prominent quality cars of today are using Houdaille shock absorbers in order to give their owners the utmost in luxury and comfort. Over rough road and bumpy streets the car equipped with Houdaille glides—creating a new sensation of comfort in motordom.

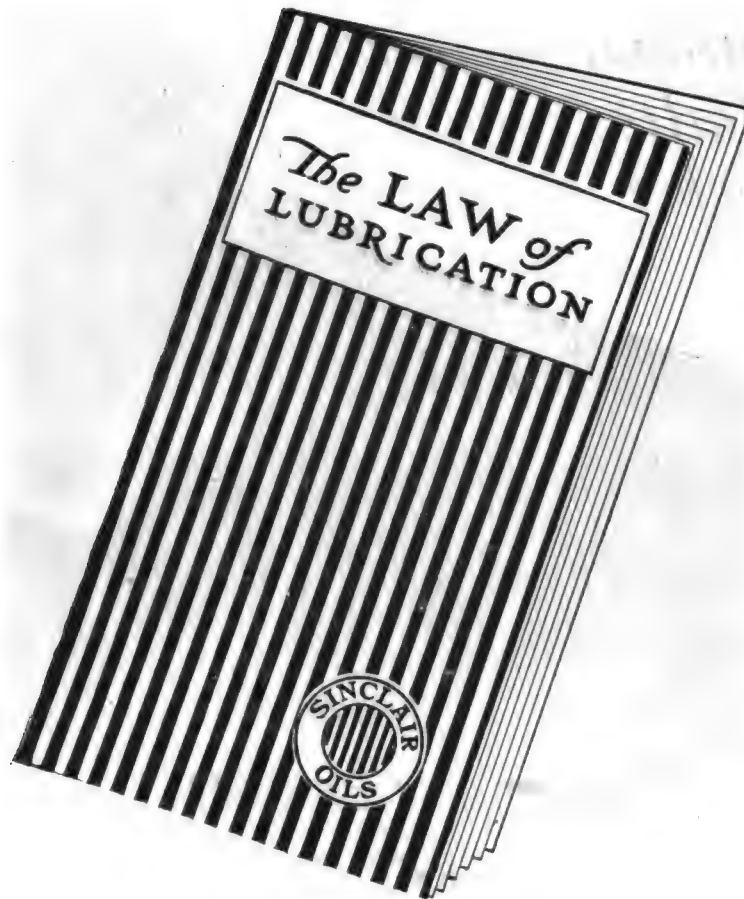
Houdaille is the master shock absorber because—it absorbs 75% of all shocks and spring vibrations; prevents body sway and broken springs; is frictionless (having only one moving part); has no straps to break nor springs to lose tension; will not rust nor squeak; is made of the finest steel and weighs only 7½ lbs.



THE HOUDE ENGINEERING CORP.

1397 WEST AVENUE

BUFFALO, N. Y.



This Book *Do You Know What Is In It?*

If you sell, buy or use motor oil you ought to know The Sinclair Law of Lubrication by heart.

You ought to know this fundamentally correct system of motor oil recommendation.

Sinclair Dealers have the right to distribute these books to their customers.

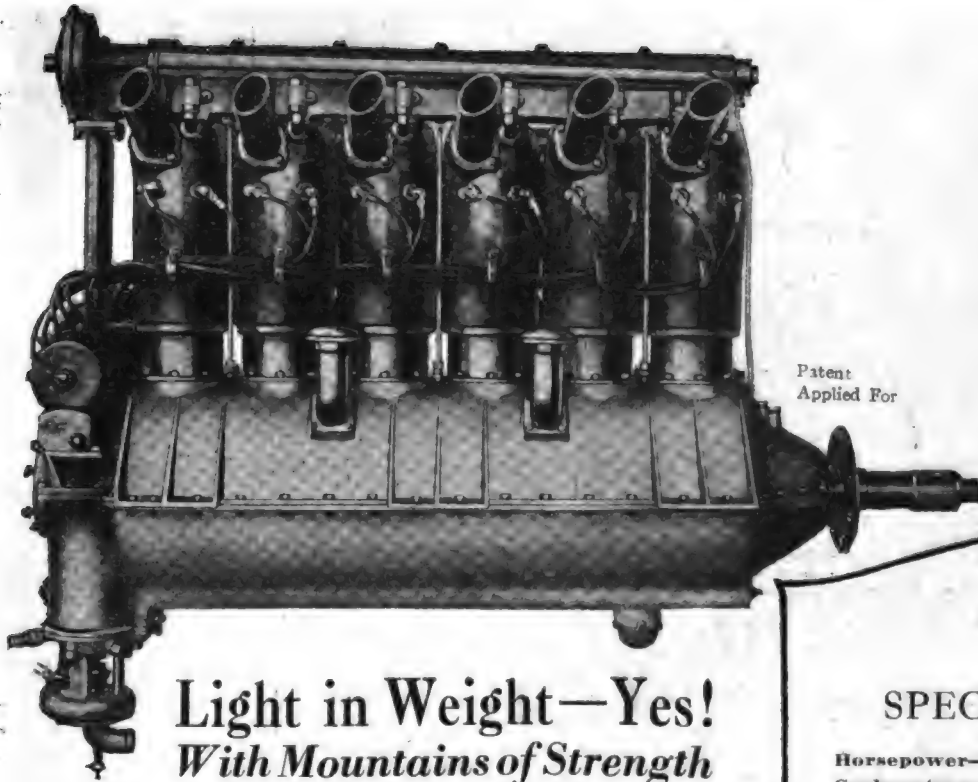
May we send *you* a copy?

SINCLAIR REFINING COMPANY, CHICAGO

Atlanta
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Kansas City



Louisville
Minneapolis
Newark
Norfolk
Omaha
Rock Island
Tulsa
Wichita



Patent
Applied For



Light in Weight—Yes! *With Mountains of Strength*

NO greater claim than performance can be made for any airplane motor. The Rausie-E6 is a refinement of the engine which conquered the mighty Andes Mountains. It successfully employs improvements that aerial practice has proved vital to the forward march in air.

The essentials of the airplane motor are reliability, light weight, fuel economy, compactness. Every detail of material and construction proves the Rausie-E 6 the embodiment of these characteristics vital to air success.

Steel Products Engineering Co.
SPRINGFIELD OHIO

RAUSIE-E 6 AIRPLANE MOTOR

SPECIFICATIONS

Horsepower—175 at sea level.

Carburetors—Two Special Miller.

Ignition—Two "Dixie" high tension magnetos.

Cylinders—Six. Made from $3\frac{1}{4}$ Nickel Steel, machined all over and fitted with aluminum jackets which screw on cylinder head.

Crankshaft—Chrome Nickel Steel, machined all over. Hollow for lightness and oil supply.

Cam Shaft—Tough machine steel; all cams integral and ground to size after heat treatment; hollow for oil supply.

Lubrication—Three gear pumps, one forcing oil from outside reservoir to all working parts; two pumps, one at each end, gather surplus oil. By this method motor cannot be fouled when flying at angles. Oil is always cooled and well filtered.

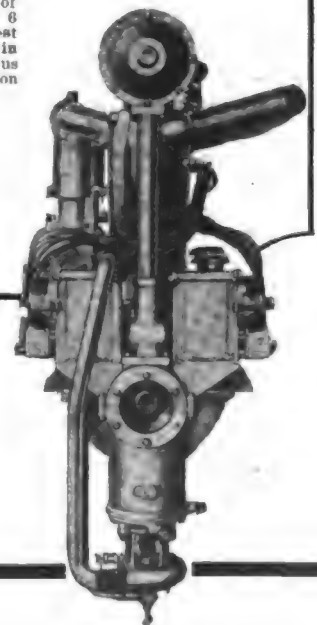
Gearing—Best alloy steel, hardened and drawn.

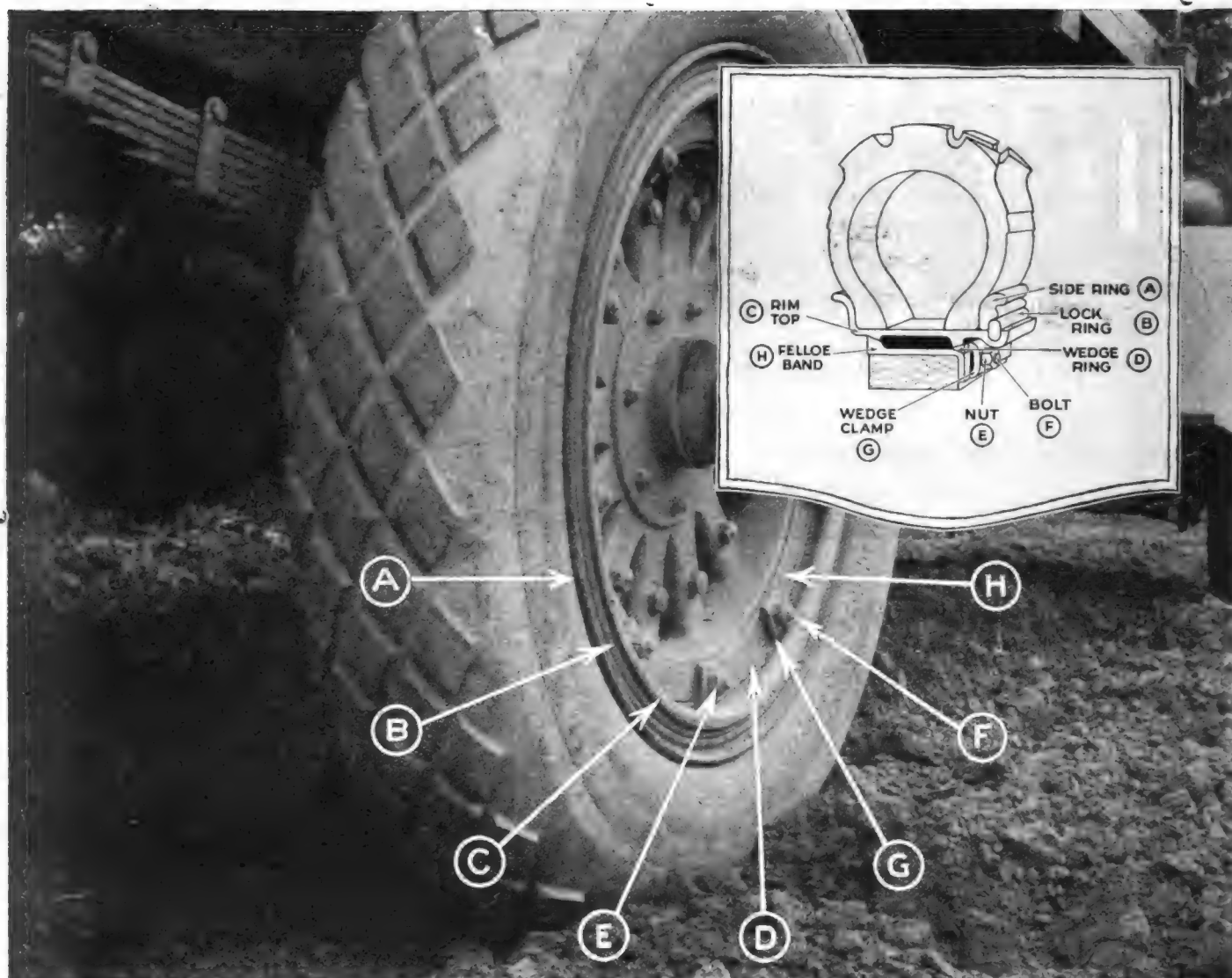
Bearings—Parsons white brass. Thrust bearing is S.K.F. self-aligning Ball Bearing, two directions.

Propeller Flange—Fitted on a taper end of crankshaft, held in place by a differential nut which puts it on and takes it off.

This 6-cylinder, 4-cycle, valve-in-head motor can be lubricated with mineral oil instead of castor oil. All revolving parts except the "prop" are enclosed. Special easy operating valve mechanism eliminates rocker arms and push rods, giving highest volumetric efficiency.

Adapted to all types of planes, the Rausie-E 6 is one of the biggest 1920 developments in aeronautics. Write us for further information on the Rausie-E 6.





Copyright 1920, by The Goodyear Tire & Rubber Co.

Pioneering Truck Pneumatics With Easy-Acting Truck Rims

WHEN Goodyear pioneered the straight side tire it laid the basis for the full success of this type of tire by also pioneering the straight side type of rim.

Marked by extraordinary simplicity and strength, the original Goodyear straight side rim presented features of such fundamental merit that these have been retained in present-day straight side rims.

The Goodyear straight side rim of today virtually is this same first rim with all its advantages including the original oval lock ring, still exclusively Goodyear's, which makes engagement and release extremely easy, also contributing to unusual rim stability.

It is apparent therefore why motor truck manufacturers have given substantial recognition to Goodyear Truck Rims made in all sizes and in the demountable and detachable types, providing a rim for every need.

The development of Goodyear Truck Rims, like the development of Goodyear Cord Tires for trucks, Truck Tire Tubes, Pressure Gauges and Repair Materials, has proceeded out of that continual search for betterment, which protects our good name.

Further information about these easily operated Goodyear Truck Rims can be obtained by writing direct to The Goodyear Tire & Rubber Company, Akron, Ohio.

GOODYEAR
TRUCK RIMS

A Babbitt Alloy for Every Purpose

THERE'S a Mogul Babbitt Alloy that will exactly meet your bearing requirements, for we make a Mogul Babbitt Alloy for every purpose where babbitt is required.

Here are five grades of babbitt metal that have been recognized as standards of quality for twenty-five years.

Mogul Alloy Genuine Babbitt is made according to the old original Isaac Babbitt formula from copper, tin and antimony—no lead used. A very fine alloy for thin bearings such as motor bearings which require a hard alloy, high in tensile strength. Suitable for both die cast and hand poured bearings.

Mogul No. 407 Nickel Babbitt is extremely hard and recommended for heavy bearings.

Mogul No. 408 Special Metal has given highly satisfactory service in armature bearings in electric railway systems. Users say it has no equal for this purpose.

Mogul Bearing Metal is for general use—particularly for bearings in stationary engines, cement mills, stone crushers, paper mills, rolling mill machinery, etc. Very hard and tough—easy to pour.

Duro Metal has proven 100% serviceable for bearings in wood-working machinery, for axle bearings in electric railway cars, cotton gins, etc. Duro does not shrink and is therefore often used for metal patterns.

Special babbitt alloys made to meet your particular specifications. Prompt deliveries and lowest prices consistent with finest quality.

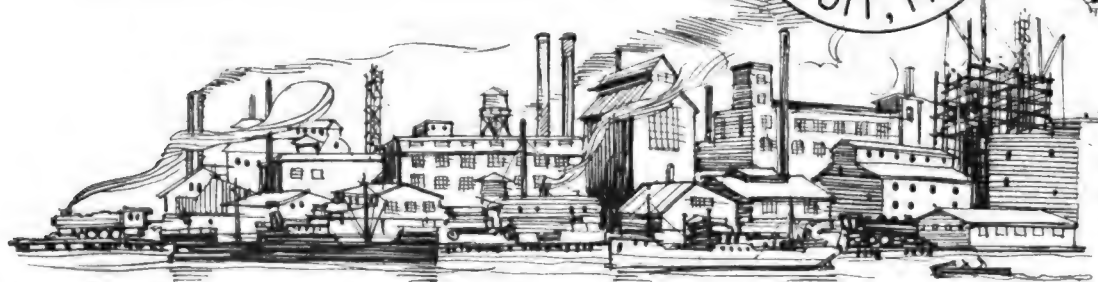
No reclaimed metals used. We guarantee every ounce of metal in Mogul Babbitt Alloys to be virgin.

Put your special babbitt alloy problems up to us.

Order Mogul Babbitt Alloys From These Jobbers

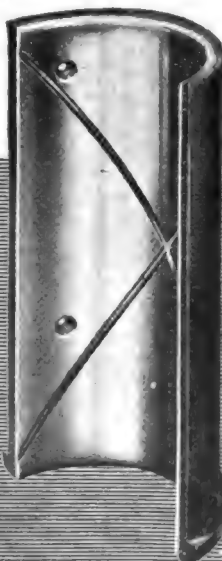
Armstrong-Wolfe-Zimmerman Co.	Pittsburgh, Pa.
Coghlin-Kirby Machinery & Supply Co.	Toledo, Ohio
Elderfield-Hartshorn Hardware Co.	Niagara Falls, N. Y.
J. D. Heckle & Co.	Memphis, Tenn.
W. W. Hite & Co.	Louisville, Ky.
F. Holtz Company	Evansville, Ind.
Edward Joy Co.	Syracuse, N. Y.
E. Keeler Company	Williamsport, Pa.
J. S. Krause-Hardware Co.	Bethlehem, Pa.
Philpsburg Hardware Co.	Philpsburg, Pa.
Reichenbach & Leiby	Allentown, Pa.
Smith Bros. Hardware Co.	Columbus, Ohio
Spaulding & Metcalf	Philadelphia, Pa.
Chas. A. Strelinger Co.	Detroit, Mich.
Chas. A. Strelinger Co., of Canada, Ltd.	Windsor, Ont.
The Wright Machine Co.	Owensboro, Ky.

MUZZY-LYON COMPANY, Detroit, Mich.



Mogul

Bearing Alloys and Finished Bearings





BRONZE- BACK BEARINGS

Inseparable
— *Babbitt and Bronze* —

By a unique and proven process of cohesion of metals, a two-part bearing—babbitt and bronze—has been produced which has the rigidity and strength of a single metal. This bronze-back bearing—the Stewart—is designed especially for use in automobile, motor truck, tractor and air craft engines, electrical equipment and on any machine requiring a smooth-running, long-lived bearing.

Through this special Stewart process of bearing construction, the babbitt lining and bronze-back are so united that they are practically one metal.

**Stewart Manufacturing
Corporation**

4500 Fullerton Ave., Chicago



April 29, 1920

AUTOMOTIVE INDUSTRIES
THE AUTOMOBILE

105

"The Motor That Made the Spad Possible"

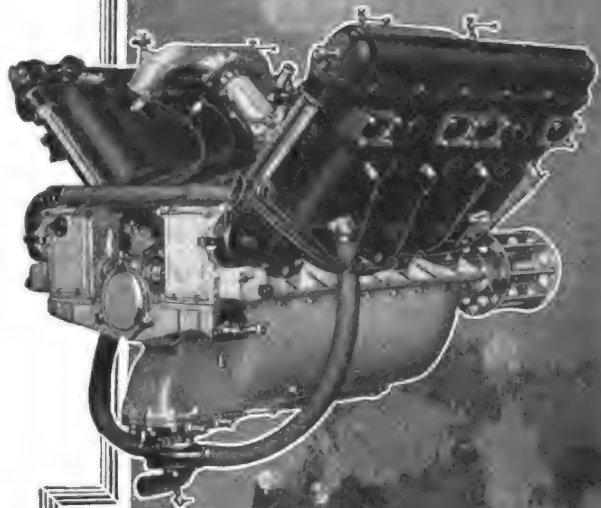
THE Hispano-Suiza Aeronautical Engine was a veteran of three years' constant and successful service abroad before our entire facilities were put behind the United States Air Programme.

This will emphasize the interest in the exhibition of the American development of this great engine, the Wright-Hispano Aeronautical Engine, at the Aeronautical Exposition at San Francisco, California, April 21st—28th, 1920.

A number of 180 H. P. (Model E) Engines for both airplanes and flying boats are immediately available for delivery to responsible purchasers.

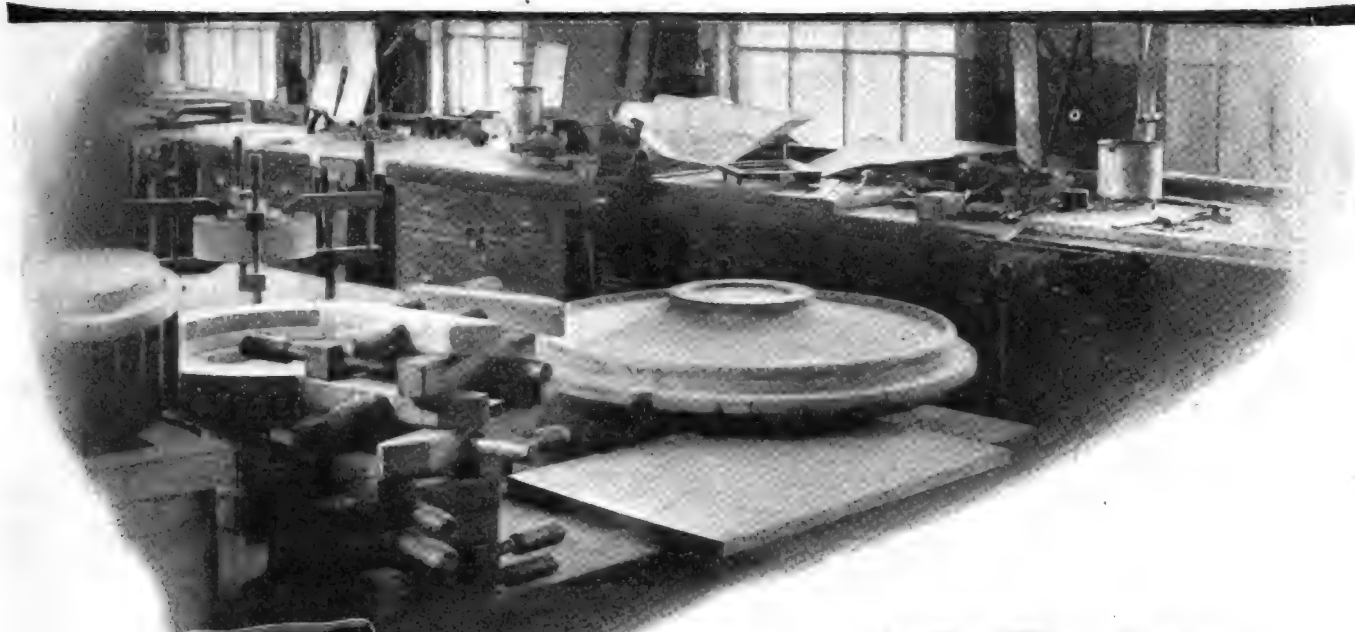
WRIGHT
Aeronautical Corporation
New Brunswick N. J.

Member Manufacturers'
Aircraft Association



WRIGHT-HISPANO
AERONAUTICAL ENGINE

Modern applications of electric heat have greatly improved methods of manufacture and saved many dollars previously wasted



As In This Case—

G-E electric glue pots have saved thousands of hours previously spent in going back and forth attending to the heating of glue.

Furthermore, enormous quantities of glue are saved by the use of an aluminum pot, because of its inherent unctuous surface and being automatically retained at uniform heat.

The pot is a single aluminum casting, thus insuring equal distribution of heat in the glue.

The single-heat unit used consumes just sufficient current to provide radiation loss and still maintain constant working temperature of glue.

Up-to-date wood-working shops are equipped with an electric glue pot on every bench.

For further information on this popular device send for descriptive sheet 69100.



General  **Electric**
General Office **Company** Sales Offices in
Schenectady, N.Y. all large cities



BRAKES

last longer with

Johns-Manville NON-BURN Asbestos Brake Lining

THE Largest producers of asbestos products in the world with the longest experience in the making of brake linings, not only for automobiles but also for the heaviest industrial machinery, *should* be able to make the most dependable brake lining for your cars.

H. W. JOHNS-MANVILLE CO.
New York City

10 Factories—Branches in 63 Large Cities

For Canada

Canadian Johns-Manville Co., Ltd., Toronto



Through—

Asbestos

and its allied products

INSULATION
that keeps the heat where it belongs

CEMENTS
that make boiler walls leak-proof

ROOFINGS
that cut down fire risks

PACKINGS
that save power waste

LININGS
that make brakes safe

FIRE
PREVENTION
PRODUCTS

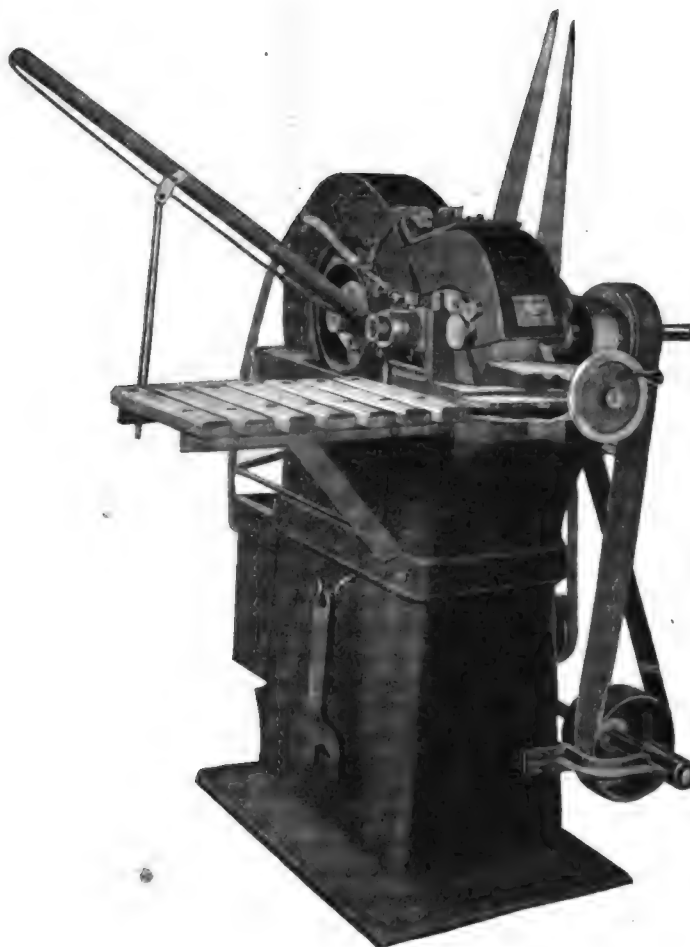
JOHNS-MANVILLE

Serves in Conservation

The Sanford Precision **Centreless Cylindrical Grinder**

THE MARVELOUS ACCURACY

is due to the three-point contact between grinding wheel, feed wheel and cylindrical work rest. The result must be right.



THE HIGH FINISH

is due to the positive rotation of the work even on the lightest finishing cuts. The Sanford will "split the tenth" and still rotate the work.

THE BIG PRODUCTION

is due to the practical absence of friction—nothing to do but work. The cylindrical work slides laterally on a cylindrical rest—point to point contact.

THE LOW UPKEEP

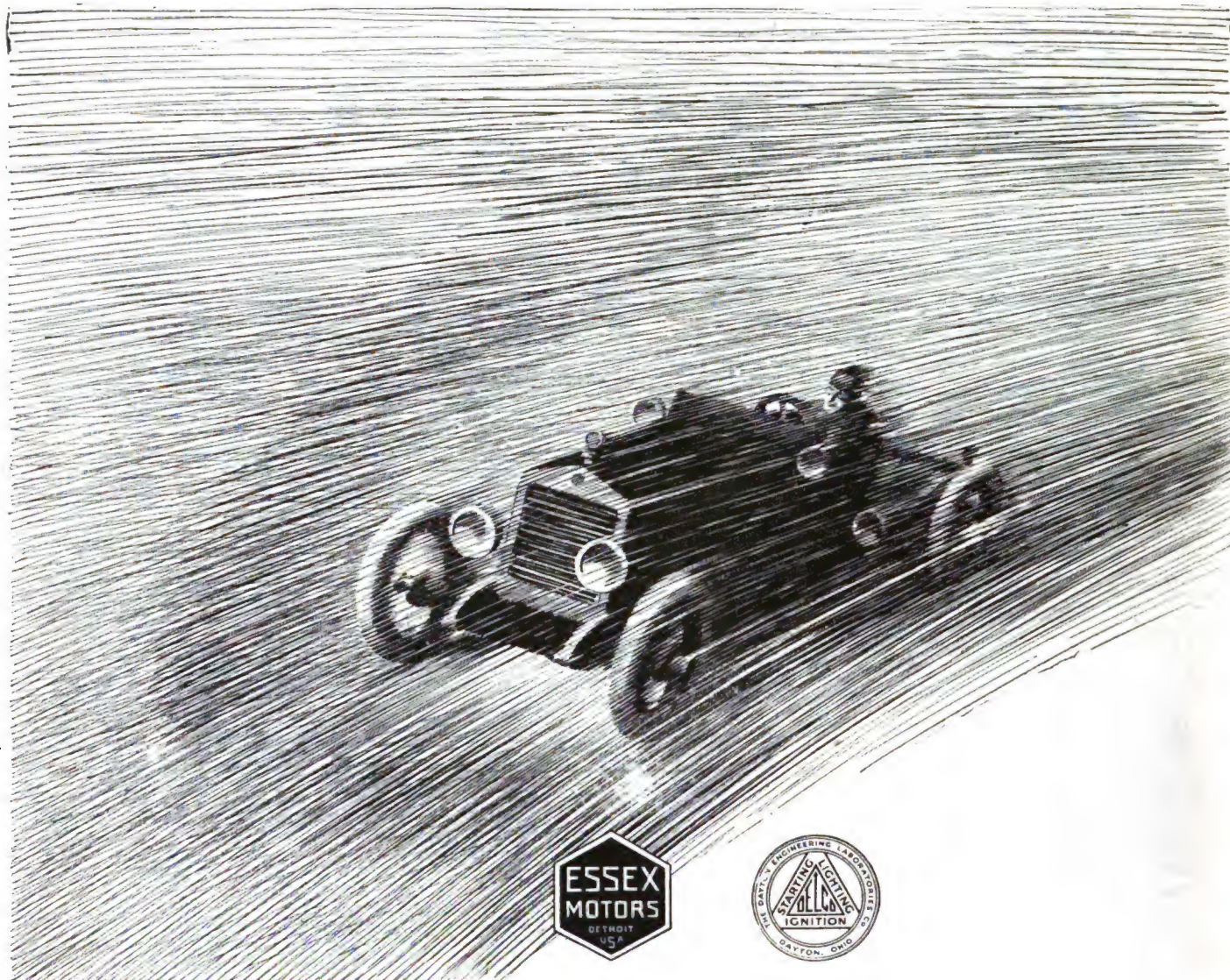
is due to the fact that the wear, outside of wheel wear, comes on the cylindrical rest, which is turned, as it wears, and is quickly and cheaply replaced.

DIAMETERS UP TO SIX INCHES
LENGTHS UP TO TWENTY INCHES

RUSSELL, HOLBROOK & HENDERSON, INC.

30 Church Street

New York City



An Essex stock car, in a gruelling fifty-hour grind, covered three-thousand and thirty-seven miles.

As usual, the performance of the Delco starting, lighting and ignition equipment was perfect.

The same Delco equipment now serves more than twenty-five thousand Essex owners.

Delco
Starting, Lighting and Ignition Systems

THE DAYTON ENGINEERING LABORATORIES CO. DAYTON, OHIO. U. S. A.

UNITED

ELECTRIC FURNACE STEELS

In the manufacture of vital automotive parts where failure is expensive, if not fatal, only the highest grade of steel is permissible.

It is for this reason we advise the use of electric furnace steels where maximum safety is imperative.



*That steel which best
serves your purpose is least
expensive.*

New York
Chicago
San Francisco
Syracuse

**United Alloy
Steel Corporation**
Canton • Ohio

Detroit
Cleveland
Indianapolis
Portland





Molybdenum Commercial Steels



Climax Molybdenum Company
61 Broadway New York

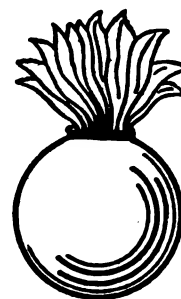
*For Your Copy
address*

Climax Molybdenum Company
or
The American Metal Company Ltd.
61 Broadway, New York

WAR DEPARTMENT

ORDNANCE SALVAGE BOARD

Surplus Property Sale



OPPORTUNITIES FOR ALL CONSUMER—RETAILER—DEALER—JOBBER. WHOLESALE—MANUFACTURER

The U. S. Ordnance Salvage Board is offering for sale through its several District Offices, listed below, large quantities and diversified classes of Materials and Equipment. The items listed in the following pages give merely a suggestion of the many different kinds of material

listed. Read each page carefully. The items described are listed under the respective Districts by which they are held; they are not grouped into classifications.

These sales embrace items of value to almost every branch of modern industry.

MATERIALS TO BE SOLD BY NEGOTIATION

Sales methods are simple. All items, unless otherwise stated, are offered for sale by negotiation, and in lots sufficiently small to give all prospective purchasers an opportunity to buy.

IMPORTANT.—Statements as to chemical analysis, specifications, conditions, or exact quantities are based on the best information available but no guarantee on behalf of the Government can be given. Purchaser will be required to accept the material "as is" in its present condition. Inspection is therefore invited. Failure to inspect will not be considered a warrant for rejections or cancellation.

CERTIFIED CHECK, cashier's check, draft or legal tender for full amount must accompany shipping instructions. Checks to be made payable to the "Treasurer of the United States."

ALL OR ANY PART of material listed may be bid on or sold.

UNIT.—Submit bid in terms of units listed, that is, quote price per piece, foot, gallon, 100 lbs. or gross ton, etc.

F. O. B. POINT.—Quote price f. o. b. cars at plant where material is located or "on ground" if contractor buys material at his plant.

WEIGHTS.—Government weights at point of shipment will govern.

DIFFERENCES IN WEIGHTS.—If any difference between the weights indicated in this Bulletin and the actual weights should be discovered, the Government will refund or forward an invoice to the purchaser to cover any discrepancy and final settlement will be based on affidavits as to correct weights.

SHIPPING INSTRUCTIONS stating desired rate of delivery and name of delivering railroad in writing must reach the Committee interested within fifteen days from date award is made. The Government reserves the right to forward the entire shipment at a steady rate or as rapidly thereafter as shipping facilities will permit, unless special arrangements at time of purchase are made with the Committee to modify shipping procedure.

DEMURRAGE.—The Government is not responsible for any demurrage, and any such charges accruing shall be paid by the purchaser.

SUBJECT TO PRIOR SALE

All items offered are subject to prior sale. Place your order promptly. Write or telegraph today.

GET THE WEEKLY DISTRICT BULLETINS

This advertisement covers only a small part of the materials and equipment offered for sale by the several Ordnance District Salvage Boards. Each District Office issues a weekly bulletin which describes in detail what that particular District has for sale. Write to the

District Offices for their bulletins. The current copies will be mailed to you promptly.

If you desire to receive regularly the bulletins of any or all of the Districts, request that your name be placed on the mailing lists.

WATCH FOR SUCCEEDING ANNOUNCEMENTS

ORDNANCE DISTRICT SALVAGE BOARDS

DISTRICT	ADDRESS	TELEPHONE NUMBER
Boston	19 Portland Street	Army Wire
Baltimore	Columbia Ave. at B. & O. R.R.	
Bridgeport	945 Main St.	Noble 791
Chicago	74th & Ashland Ave.	Superior 10,000
Cincinnati	3rd & Vine Sts.	Main 3732
Cleveland	2036 E. 22nd St.	Prospect 3670
Detroit	35 Washington Blvd.	Cadillac 7680

DISTRICT	ADDRESS	TELEPHONE NUMBER
New York	1107 Broadway	Army Wire
Philadelphia	1710 Market St.	Locust 5120
Pittsburgh	Neville Island, Coraopolis, Pa.	30163
Rochester	1048 University Ave.	Chase 4896
St. Louis	Missouri State Life Bldg.	Olive 6960
Toronto	Room 21, 43 Victoria St.	
Old Hickory	Jacksonville, Tenn.	

Write for a Bulletin TO-DAY

WAR DEPARTMENT

ORDNANCE SALVAGE BOARD

Surplus Property Sale

BOSTON DISTRICT—19 Portland Street
Telephone Army Wire

SCREW MACHINES

Twelve National Acme Co. $1\frac{3}{4}$ " Gridley multiple spindle automatic, standard equipment. Location—Brockton, Mass.

Four National Acme Co. $2\frac{3}{8}$ " Gridley Automatic single spindle, belt driven, each equipped as follows: 1 Universal countershaft, 1 chain drive pump and piping, 2 cams, attached to drum, 4 tool holders for turret, 3 weights (feed), 1 cutting-off tool holder, 3 oil guards, 1 form tool holder, $\frac{1}{2}$, $\frac{3}{8}$ Collet, $\frac{1}{2}$, $\frac{3}{8}$ puncher tube, 2 stock supports. Countershaft has tight and loose worm shaft pulley, universal joint, 4 pressed steel hangers 20" by 16", turret indexing pulley, 1 feed pulley, 1 spindle drive pulley. Location—Worcester, Mass.

Three National Acme Co. $3\frac{1}{4}$ " Gridley Automatic, single spindle, belt driven, equipped with 1 plain countershaft, 1 set wrenches, 2 stock supports, 1 oil pump, 1 master collet, 1 master stock pusher for holding bushings, 1 flat forming, 1 cutting off and 1 vertical forming tool holder, 1 corner stock stop, 1 set cams, including feed cams for five medium and coarse feeds. Location—Framingham, Mass.

Two National Acme Co. $3\frac{1}{4}$ " Gridley Automatic single spindle, complete with countershaft and pulleys. Location—Framingham, Mass.

Three Cone Automatic Machine Co. $1\frac{1}{2}$ " Automatic four spindle Standard equipment. Location—Brocton, Mass.

OPEN HEARTH NICKEL STEEL PLATES

Item No. 1

51,509 lbs.—22" x $32\frac{1}{2}$ " x .28" D. S. No. 1366.

11,071 lbs.— $6\frac{1}{2}$ " x 24" x .31" D. S. No. 1366.

17,242 lbs.—11" x 27" x .43" D. S. No. 1123.

Analysis: (Appros.) Chemical: Carbon .25; Manganese .40-.60; Sulphur not over .04; Phosphorus not over .04; Nickel 3.25.

Analysis: Physical: Elastic limit 63,000 lbs. per sq. inch.

Elongation after rupture 18%; tensile strength 100,000 lbs. per sq. inch. Location—Scituate Salvage Station, Scituate, Mass.

TURRET LATHES

Two Garvin Machine Co. No. 22 SP Hexagon Turret, equipped with air chuck and 3 speed cone countershaft with reversible clutch. Location Abington, Mass.

Three Garvin Machine Co. No. 22 SP six tool round turret, equipped with air chuck, 3 tool posts and countershaft. Location—Abington, Mass.

LATHES

One Blood type equipped with chuck for 3" shell. Location—Worcester, Mass.

SPEED LATHES

Four Wells Sons & Co. Speed 4' bed, no countershafts or tailstocks. Location—Framingham, Mass.

PUNCH PRESSES

Two Toledo Mach. & Tool Co.—4 No. 56 Presses 3 12" stroke, 1 15" stroke. Location—Worcester, Mass. 2 58½ Toledo, 6" stroke. Location—Worcester, Mass.

TRIMMING PRESSES

Two East Iron & Machine Works. Maxim, with hopper. Special. Location—Abington, Mass.

One East Iron & Machine Works, Maxim, piercing and trimming, 2"-3" throat. No. 12 W. P. 4" stock. Special Mass.

One East Iron & Machine Works. Maxim, vertical trimming, 2"-3" throat. No. 12 W. P. 4" stock. Special 8" opening under housing. Location—Abington, Mass.

Boston District also has for sale the following classes of material and equipment:

Boring Machine, Cutting Down Barrel, Drill Presses, Drilling Machine, Equipment for Tapping Machine, Grinders, Cutter Grinder, Lathes, Punch Press, Presses (Hydraulic), Press, Screw Machines, Screw Driving Machines, Shell Tester, Shredding Machine, Slashing Machine, Thread Millers.

Weekly Bulletin containing complete details about these items will be mailed to you upon request to Chairman, Boston District Ordnance Salvage Board, 19 Portland Street, Boston, Mass.

Write TO-DAY for Latest Weekly BULLETIN

WAR DEPARTMENT

ORDNANCE SALVAGE BOARD

Surplus Property Sale

BRIDGEPORT DISTRICT— 945 Main Street
Telephone Noble 791

NORTON GRINDER

One Norton 18" x 120" Plain Grinder, Belt Drive. Location
U. S. Government Warehouse No. 188, (Wire Wheel Corpora-
tion), East Springfield, Mass.

PRICE—\$6,500 F. O. B. Springfield, Mass.

Material listed below sold by negotiation

See first page of this advertisement for terms of sale

CHROME NICKEL STEEL

Lot No. 3412

49,910 lbs. Chrome Nickel steel. Size
13/32" sq.—6-12' lengths. Anal.: Carbon
.80-.90.

COLD ROLLED STEEL

Lot No. 3409

364 lbs. cold rolled steel, 11/16" x
9/16"—18' lengths. Anal.: Carbon .15-
.25. Location—Moore Drop Forge Co.,
Springfield, Mass.

COLD ROLLED SCREW STOCK

Lots Nos. 2785-2786-2787, Item 1

22 lbs. Colt's Patent Fire Arms Mfg.
Co., Hartford, Conn. Size .0625. Car-
bon .08-.16.

Item 2

5 lbs. Colt's Patent Fire Arms Mfg.
Co., Hartford, Conn. Size .082. Carbon
.08-.16.

Item 3

660 lbs. Colt's Patent Fire Arms Mfg.
Co., Hartford, Conn. Size .250. Carbon
.08-.16.

WOOD CASES

Lot No. 5988

2,635 Wood Cases with tin liners, 45
without liners. Size 15" x 10" x 9". Lo-
cation—The Remington Arms U. M. C.
Co., Inc., U. M. C. Bridgeport Wks.,
Bridgeport, Conn.

HOT ROLLED STEEL

Lot No. 2781

19,860 lbs. Colt's Patent F. A. Mfg.
Co., Hartford, Conn. 2 1/2 x 1. Carbon
.15-.20, M. .50-.90, Sil. .02-.15, S. .06,
Phos. .06.

Lot No. 3399

8,800 lbs. Moore Drop Forge Co.,
Springfield, Mass. Size 1 1/4" x 3/8"—10'
lengths. Carbon .15-.25.

Lot No. 3400

1,426 lbs. Moore Drop Forge Co.,
Springfield, Mass. 3/4" sq, 16' and 18'
lengths. Carbon .80-.90.

Lot No. 3401

4,765 lbs. Moore Drop Forge Co.,
Springfield, Mass. 7/8" Rd., 14' lengths.
Carbon .15-.25.

Lot No. 3402

5,130 lbs. Moore Drop Forge Co.,
Springfield, Mass. 5/8" Rd., 6'-12'
lengths. Carbon .15-.25.

Lot No. 3403

121,507 lbs. Moore Drop Forge Co.,
Springfield, Mass. 1 3/8 sq, 24' lengths.
Carbon .30-.40.

Lot No. 3404

112,133 lbs. Moore Drop Forge Co.,
Springfield, Mass. 7/8" sq, 5'-6' lengths.
Carbon .15-.25.

Lot No. 3405

44,635 lbs. Moore Drop Forge Co.,
Springfield, Mass. Size: 3/4" sq, 10'
lengths. Carbon .30-.40.

Lot No. 3406

50,175 lbs. Moore Drop Forge Co.,
Springfield, Mass. 1" sq, 18'-20' lengths.
Carbon .15-.25.

Lot No. 3407

39,320 lbs. Moore Drop Forge Co.,
Springfield, Mass. 1" sq, 5'-10' lengths.
Carbon .45-.55.

Lot No. 3408

10,300 lbs. Moore Drop Forge Co.,
Springfield, Mass. Size: 3/8" x 1/4", 14'-
16' lengths. Carbon .15-.25.

Lot No. 3413

5,689 lbs. Moore Drop Forge Co.,
Springfield, Mass. 1 1/4" x 3/4", 18'-20'
lengths. Carbon .15-.25.

Lot No. 5701

5,689 lbs. Moore Drop Forge Co.,
Haven, Conn. Size: 9/16" x 3/8", 9'
and 10' lengths. Carbon .95-1.10; Sil.
.15-.20; Mang. Max. .40; Sul. .022; Phos.
.019.

Bridgeport District also has for sale
the following items: Steel Scrap, Seam-
less Steel Tubing, Benzol, Light Brass
Scrap, Paper Cartons, Pine Lumber,
Wood Cases—tin lined.

Details of which will be found in the
Bridgeport Weekly Bulletin, sent on re-
quest. Send for copy of the bulletin
NOW.

to any District Office, See 1st page of this advertisement

WAR DEPARTMENT

ORDNANCE SALVAGE BOARD

Surplus Property Sale

CHICAGO DISTRICT—74th and Ashland Ave.
Telephone Superior 10,000

GRINDING MACHINES

2—Fitchburg Grinding Mach. Co.

6 in. x 20 in. Location, Chicago Storage Depot.

4—Fitchburg Grinding Mach. Co.

12 in. x 30 in. Location, Chicago Storage Depot.

3—Fitchburg Grinding Mach. Co.

12 in. x 36 in. Location, Chicago Storage Depot.

TURRET LATHES

5—Gisholt Mach. Co.

24 in. turret lathe, equipped with 3 jaw universal chuck, taper attachment. Location, Chicago Storage Depot.

4—Gisholt Mach. Co.

24 in. turret lathe without cross carriage or chuck. Location, Chicago Storage Depot.

3—Gisholt Mach. Co.

24 in turret lathe without chuck with taper attachment. Location, Chicago Storage Depot.

HEAVY DUTY LATHE

3—R. K. LeBlond Mach. Tool Co.

19 in. x 8 ft., 3 step cone, double back gears, hexagon turret on carriage. Location, Chicago Storage Depot.

HEAVY DUTY LATHE

8—American Mach. Tool Co.

20 in. x 8 ft., 3 step cone, double back gears, quick change gears. Location, Chicago Storage Depot.

SURFACE GRINDER

1—Diamond Machine Co.

Horizontal and vertical head motion, table 12 in. x 24 in., wheel 12 in. Distance from table to center of wheel 12 in. Location, Chicago Storage Depot.

CHUCKING LATHE

3—American Tool Works

20 in. 8 ft., converted American Engine lathe, Hexagon turret, 3 step cone, double back gears, quick change gears, power feed to turret. Location, Chicago Storage Depot.

Chicago District offers for sale the items listed on this page only

At Fixed Prices

No Delays No Restrictions

The information covering machines and equipment listed on this page has been obtained from the best sources available. The Government invites inspection before purchase and assumes no responsibility as to condition or completeness.

All machines and equipment listed on this page are subject to prior sale. No options will be granted.

Sales Will Be Made for Cash Only

Information regarding inspection, location, etc., may be obtained upon application to Chicago District Ordnance Salvage Board, 74th St. and Ashland Ave., Chicago, Ill. Phone Superior 10,000.

CHUCKING LATHE

5—R. K. LeBlond Mach. Tool Co.

25 in. x 10 ft., 3 step cone, double back gears, quick change gears, equipped with special 2 cross feed carriages, tool rest, 2 large cast iron brackets and plate and one mandrel. Location, Chicago Storage Depot.

CHUCKING LATHE

3—R. K. LeBlond Mach. Tool Co.

21 in. x 8 ft., 3 step cone, double back gears, quick change gears, 4 face turret tool, post, equipped with special profiling attachment. Location, Chicago Storage Depot.

CHUCKING LATHE

8—Milholland Mach. Co.

15½ in. x 10 in., spindle bore 2 in., 3 step cone, back geared, friction head, hand feed to turret and cross slide only, equipped with pump. Location, Chicago Storage Depot.

CHUCKING LATHE

6—Smurr & Kaman Co.

15½ in. x 10 in., 3 step cone, back geared, friction head, 6 hole turret, bar feed. Location, Chicago Storage Depot.

A Weekly Bulletin of the Chicago District that gives complete details of all of the surplus property available will be sent free to anyone interested upon request to Chairman, Chicago District, Ordnance Salvage Board, 74th St. and Ashland Ave., Chicago, Ill.

Write TO-DAY for Latest Weekly BULLETIN

WAR DEPARTMENT

ORDNANCE SALVAGE BOARD

Surplus Property Sale

CINCINNATI DISTRICT—3rd and Vine Sts.
Telephone Main 3732

STEEL

Serial No. 2151

1,980 lbs. annealed carbon; 84 pcs. 17/32" x 5/16"; 6 ft. lengths. Location, National Cash Register Co., Dayton, Ohio.

Serial No. 1562

(A) 1,000 lbs. 3/4" round; SAE 2320.
(B) 2,200 lbs. 1 1/4" round; SAE 1020.
(C) 9,000 lbs. 3" round; SAE 1020.
(D) 2,200 lbs. 2" x 3 1/4"; SAE 1020.
(E) 1,000 lbs. 2 1/2" x 11"; SAE 2340.
(F) 1,500 lbs. 4" square; carbon 10-20.
(G) 900 lbs. 1/2" x 1 1/2" flange. Location—Maxwell Motor Company, New-castle, Indiana.

Serial No. 2292

8684 lbs. 1 5/16" round screw stock; mill lengths; good condition. Location—Superior Machine Tool Co., Kokomo, Ind.

Serial No. 1522

234,400 steel discs, 1 1/2" dia., 16 gauge, weight approx. 7300 lbs. each with small hole in center. Sample upon request. Location—Unexcelled Mfg. Co., Cincinnati, Ohio.

BRONZE ROD

Serial No. 2154

(A) 166 lbs. 17/32" x 8" rd.
(B) 5514 lbs. 21/32" x 5' to 8' rd.
(C) 453 lbs. 7/8" x 8' rd.
(D) 2872 lbs. 1 3/8" x 6' rd.
(E) 1797 lbs. 1 1/8" x 8' rd.
(F) 547 lbs. 1" x 8' rd.

Location—National Cash Register Co., Dayton Ohio.

THREAD MILLERS

Item No. 2111

Six Lees Bradner Co., No. 3, Internal. Location—Indiana Brass Co., Frankfort, Ind.

Item No. 2112

Six Foster Machine Co., Internal, 2" chuck capacity; belt drive. Location—U. S. Storage Depot No. 1, Linwood, Cincinnati, Ohio.

Item No. 2113

Eight Lees Bradner Co., External, No. 3. Location—Indiana Brass Co., Frankfort, Ind.

Item No. 2114

Six Foster Machine Co., External, 2" chuck capacity, belt drive. Location—U. S. Storage Depot No. 1, Linwood, Cincinnati, Ohio.

Item No. 2115

One Taft Pierce Co., Archdale; direct belt drive; standard equipment. Location—U. S. Storage Depot No. 1, Linwood, Cincinnati, Ohio.

TRAYS

Item No. 21248

200 pine work trays. Location—U. S. Storage Depot No. 1, Linwood, Cincinnati, Ohio.

GRINDERS

Item No. 212

Four Liberty Pressed Metal Co., Special cup wheel. Location—Liberty Pressed Metal Co., Kokomo, Ind.

TANKS

Item No. 21223

Six 14 1/2" x 21 1/4" x 25", sheet steel, tempering. Location—U. S. Storage Depot No. 1, Linwood, Cincinnati, Ohio.

Item No. 21229

Six Hauser Stander Tank Co., Cy-press, for plating outfit; 2'6" x 2'6" x 5' inside dimensions; 2 1/2" stock. Location—U. S. Storage Depot No. 2, Cincinnati, Ohio.

NICKEL STEEL BARS

Serial No. 2145

87,720 lbs. (690 pcs.) 1 1/8" round, hot rolled, heat treated, special 3% nickel steel bars; 12 ft. lengths. SAE 3120. Location—Warner Gear Co., Muncie, Ind.

Cincinnati District also has for sale the following classes of materials and equipment:

Anvils, Broachers, Commissary Equipment, Drill Heads, Grinders, Grinders (Electric), Grinders (Floor), Grinding Fixtures, Grinding Machines, Grinding Wheel Dressers, Guards, Hammers, Hand Feed Knife, Housing Gear, Knife Wheels, Metal & Metal Scrap, Pillow Blocks, Tapping Heads, Threading Devices, Threading Machines, Turret Lathe Stops.

Weekly Bulletin containing complete details about these items will be mailed to you upon request to Chairman, Cincinnati District Ordnance Salvage Board, Walsh Building, Cincinnati, Ohio.

to any District Office, See 1st page of this advertisement

WAR DEPARTMENT

ORDNANCE SALVAGE BOARD

Surplus Property Sale

CLEVELAND DISTRICT—2036 E. 22nd St.
Telephone Prospect 3670

ENGINE LATHES

77—Bridgeford Machine Tool Works

Size 26 in. x 9 ft., swing over ways 27 in., swing over carriage 17½ in. Cone drive, double back gear, compound rest and quick change gear box. Range of spindle speeds 6 to 250 RPM. Ratio of gearing 1 to 14, range of threads 1 to 14 and 2 to 28. Location, Ohio Storage Depot No. 1, Toledo, Ohio.

SPECIAL LATHES

42—Root & Vandervoort Co.

Single Pulley, geared drive, 4 tool turret and back tool holder, with one set of tools on carriage. Equipped with Hanifin Air Chuck complete with control valve and piping. Swing over ways 11½ in., swing over carriage 6 in.; travel of carriage 26 in.; capacity of chuck 8 in. Special machine for 8 in. high explosive shells. Location, Ohio Storage Depot No. 1, Toledo, Ohio.

ENGINE LATHES

1—R. K. Leblond Co.

25 in. x 12 ft., heavy duty engine lathe, swing over shears 28 in., over carriage 20 in., distance between centers 6 ft. 2 in., double back geared compound rest, quick change gear box, 3 step cone pulleys. Equipped with three jaw independent chuck. Location, Ohio Storage Depot No. 1, Toledo, Ohio.

GRINDERS (Universal)

1—Warren F. Frazer Co.

Bath Universal No. 1, belt drive, maximum distance from center to center 18 in.; travel of table 20 in.; cross travel of wheel head 6¼ in.; automatic longitudinal and cross feed, swing over table 8½ in.; travel of tail stock spindle ¾ in. Standard equipment and countershaft complete. Location, Ohio Storage Depot No. 1, Toledo, Ohio.

HYDRAULIC PRESSES

4—R. D. Wood & Co.

400 ton capacity Vertical Press used for drawing shells. Operator valves, piping and fittings complete. Location, Ohio Storage Depot No. 1, Toledo, Ohio.

ENGINE LATHES

10—Niles-Bement-Pond Co.

30 in. x 14 ft., center drive. Distance between centers on head and tail stock 46 in. on one end and 50 in. on the other. Quick change gears. Location, Ohio Storage Depot No. 1, Toledo, Ohio.

TURRET LATHES

2—Warner & Swasey Co.

No. 3-A Standard Universal Turret Lathes. Geared head, geared automatic feed, 21½ in. swing with 4½ in. x 44 in. bar capacity. Equipment 16 in. universal chuck, oil pump and countershaft. Location, Cleveland, Ohio.

DRILLING MACHINES

Wall or Post Bracket

15—Strong, Carlisle & Hammond Co.

No. 2 wall or post bracket type, suitable for rapid drilling of small holes within a radius of seven feet. Capacity of machine ¾ in. steel. Spindle bored for No. 2 Morse Taper. Spindle has feed of 2½ in. Location, Ohio Storage Depot No. 1, Toledo, Ohio.

AUTOMATIC SCREW MACHINES

5—National Acme Co.

Gridley Automatic Multiple Spindle, motor drive, capacity of chuck 1¼ in. round, 1.237 in. square, 1.515 in. hexagon. Driven by Western Electric Motor 7½ H.P., 3 phase, 60 cycle, 440 volts, 1200 RPM, with auto starter. Standard equipment. Location, Cleveland, Ohio.

TURRET LATHES

20—American Tool Co.

20 in. x 8 ft. special American turret lathe. Two step cone, double back gear head, two speed countershaft, with hexagon turret on carriage, rotary oil pump, special heavy steady rest and Hanifin Air Chuck with 8½ in. capacity. Swing over ways 22 in., swing over carriage 7 in., travel of carriage 44 in. Not equipped with large face plate, tail stock, compound tool rest, steady rest, and lead screw. Location, Ohio Storage Depot No. 1, Toledo, Ohio.

NOSING PRESSES

5—Toledo Machine & Tool Co.

Toledo No. 59, with 2 plain fly wheels, feeding mechanism for 8 in. shell. Location, Ohio Storage Depot No. 1, Toledo, Ohio.

The Cleveland District also has for sale the following items, complete description of which will be found in the Cleveland District Weekly Bulletin mailed upon request. Blowers; Forges, Chain Hoists, Hydraulic Accumulator, Coal Pulverizing Mill, Chrome Vanadium Steel, Machine Steel, Armor Plate, Spring Steel and Steel Wire, Air Compressors, Sand Blasting Machines, Gas Furnaces, Saw Discs and many other items of Shop Equipment.

Write for weekly Bulletin NOW.

Write TO-DAY for Latest Weekly BULLETIN

WAR DEPARTMENT

ORDNANCE SALVAGE BOARD

Surplus Property Sale

DETROIT DISTRICT—35 Washington Blvd.
Telephone Cadillac 7680

All items listed, except as noted unless otherwise indicated, are located at Detroit Ordnance Storage Depot, Detroit, Mich.

ENGINE LATHES

13—Gisholt Machine Co.

25 in. x 10 ft. Heavy Duty. 7 in. spindle, 5¼ in. bore. Two step cone, belt drive on back gear shaft. Single back gear drive. No thread on spindle. Quick change gear box. 17 to 160 cuts per inch. No lead screw. With oil pump, pan and piping. With tail stock. Special 5 in. diameter 3 in. long expanding arbor with face plate adapter.

SURFACE GRINDERS

18—Y. B. Yates Machine Co.

Model 275. 68 in. table, 24 in. wheel, 12 in. hole, 10 in. x 4 in. drive pulley for wheel. Table drive pulley R. and L. 10 in. x 2 in. Pump. Complete with standard equipment.

BORING OR TAPPING

7—Jackson, Church Wilcox Co.

Special 2 spindle. Horizontal. 3½ in. swing over vise. 2 in. diameter. 6 in. deep hole in spindle. Universal two-jaw vise. Belt drive. Spindle at each end of bed. 5 in. thread on each spindle for feed control.

ENGINE LATHES

9—Gisholt Machine Co.

25 in. x 10 ft. Heavy duty. 7 in. spindle, 5¼ in. bore. Two step cone, belt drive on back gear shaft. Single back gear drive. No thread on spindle. Quick change gear box. 17 to 160 cuts per inch. No lead screw. With oil pump, pan and piping. No tail stock or face plate. 6 in. nut type collet chuck. Cross feed boring bar attachment. Adjustable center in spindle. 10 in. air cylinder and chuck complete.

ENGINE LATHES

12—Walcott Lathe Co.

26 in. x 8 ft. Three step cone drive. Double back gears. Quick change gears on feed. Special profile fixtures. Cross feed. Tool rest. Chucking arbor for shell.

CUT-OFF MACHINES

6—Modern Machine Tool Co.

3½ in. For round stock. Three-step cone drive. Throw-out clutch. Hand control.

ENGINE LATHES

8 Walcott Lathe Co.

26 in. x 8 ft. Plain. Three step cone belt drive. Double back gear. Tail stock. Carriage. No compound cross feed, lead screw, face plate, tool post, steady nor follow rests. Special 2¼ in. x 1½ in. long expanding arbor, profile fixture, cross feed tool holder with profile attachment.

THREAD MILLERS

3—Smalley General Company

"B" thread. Collet chuck. Oil pan and chuck. Countershaft. Complete equipment.

ENGINE LATHES

6—Putnam Machine Co.

36 in. special. 28 ft. bed. Belt drive. Pump and fittings. Motor attached. 2 H.P., 3 ph., 60 cyc., A.C., 1200 R.P.M., 440 V. Ind. Standard equipment.

ENGINE LATHES

19—Fitchburg Machine Co.

3½ in. x 60 in., 10-swing, 18 in. pulley. Threaded spindle. Single tool taper attachments.

TURRET LATHES

6—Fulton Machine Tool Co.

18 in. x 6 ft. Hex. turret. 2⅞ in. collet chuck. 1¼ in. hole in spindle. 3-step cone, back gears, belt drive, oil pumping system. Threaded spindle.

TURRET LATHES

7—Wood Turret Mach. Co.

12 in. x 6 ft. Tilted hex. turret. Saddle surface. Three step cone, draw in clutch. R. and L. hand pump.

This is only a small part of the vast number of machines the Detroit District has for sale. There are Boring Machines, Facing Machines, Production Lathes, Presses, Planers, etc. Then, too, there is a large quantity of shop equipment, such as Furnaces, Chains, Forges, Air Compressors, Pumps, Testing Machines, Scales, and many other items.

All this machinery and equipment has been listed and completely described in the Detroit District Bulletin. Write for this free Bulletin today for between its covers you will find many items that will interest you.

to any District Office, See 1st page of this advertisement.

WAR DEPARTMENT

ORDNANCE SALVAGE BOARD

Surplus Property Sale

NEW YORK DISTRICT—1107 Broadway
Telephone Army Wire

LATHES

10—McCabe

Double spindle lathes, 48 in. x 10 ft., belt drive, standard equipment. Location, R.A., Metuchen, N. J.

AUTOMATIC SCREW MACHINES

3—Pratt & Whitney

Screw Shaving Machines No. 2. Located at S. M. Co., Elizabethport, N. J.

DRILL PRESSES

1—Landau Machine and Drill Press Co.

One Multiple Drill Press, belt drive, with four chucks mounted on revolving frame. Located at H. T. Co., New York City.

1—Leland Gifford Co.

Five-Spindle Drill Press. Distance from column to center of spindles, 6 in.; between centers of two outside spindles, 26 in.; table, 11¼ in. x 39 in. Located at M. E. Co., Brooklyn, N. Y.

3—J. E. Snyder & Sons

Single Spindle Back Geared Drill Presses, 28 in. Located at W. M. C. Co., Jersey City, N. J.

1—Turner Machine Co.

One Four-Spindle Turret Drill, four-cone drive. Located at W. M. C. Co., Bayonne, N. J.

MILLING MACHINES

1—Forster Machinery Co.

Holden Morgan Thread No. 3. Located at U. S. A. Co., Poughkeepsie, N. Y.

38—Garvin

No. 3, hand, belt drive, standard equipment, less vise. Located at the N. C. R. Co., New York City.

1—Pratt & Whitney

One size 12 Profile Milling Machine with regular equipment. Located at S. M. Co., Elizabethport, N. J.

AIR HAMMERS

1—Ingersoll-Rand Co.

Two Little David Air Hammers, Size No. 60. Located at R. A., Metuchen, N. J.

PUMPS

1—Hydraulic Press Mfg. Co.

Two Class "C" Hydraulic Pumps, working pressure 1,500 lbs. per square inch, capacity 5 gals. per minute at 100 R.P.M. Located at U. M. Co., Graniteville, S. I.

1—Hopedale Mfg. Co.

Twenty-four Roco Pumps with check valves complete. Size No. 3, belt driven. Located at the U. S. A. Co., Poughkeepsie, N. Y.

6—Fulflo Pump Co.

No. 3 Pumps. Located at (W. S. Co.) N. Y. O. S. D., Old Bridge, N. J.

22—Roco Geared Oil Pumps

No. 3 Roco. Located at (W. S. Co.) N. Y. O. S. D., Old Bridge, N. J.

LATHES

1—Blaisdell Machine Co.

One 21 in. x 14 ft. Engine Lathe. Located at (W. S. Co.) N. Y. O. S. D., Old Bridge, N. J.

1—Harrisburg Machine Co.

One Harrisburg 20 in. x 12 ft. Engine Lathe. Located at (W. S. Co.) N. Y. O. S. D., Old Bridge, N. J.

1—F. E. Read

24 in. x 11 ft. Engine Lathe, including 20 in. chuck and Pratt & Whitney Oil Pump No. 2. Located at S. & C. Mfg. Co., Newark, N. J.

2—Diamond Machine Co.

Gun Barrel Boring, ¾ in. x 36 in. Located at S. M. Co., Elizabethport, N. J.

TURRET LATHES

2—Acme Machine Tool Co.

Flat turret, 3¼ in. x 36 in. Located at the S. M. Co., Elizabethport, N. J.

1—Bardon & Oliver

One 16 in. x 5 ft. Turret Lathe with 8 collets, pulleys and countershaft complete. Located at H. T. Co., New York City.

1—National Woodworking Machine Co.

Eight Turret Screw Machines, Size No. 4, with countershaft. Located at (K. Co.) N. Y. O. S. D., Old Bridge, N. J.

GEAR CUTTERS

1—Nilson-Miller Co.

One Special Gear Cutting Machine. Located at N. M. P., Hoboken, N. J.

The New York District is also offering for sale a large quantity of Steel and Wood Pulleys and Power Transmission equipment; Motors and other electrical equipment; Iron, Steel, Brass and Aluminum.

Details of this material and equipment will be found in our Weekly Bulletin, a copy of which will be sent on request. Send for a copy of the Bulletin NOW.

Write TO-DAY for Latest Weekly BULLETIN

WAR DEPARTMENT

ORDNANCE SALVAGE BOARD

Surplus Property Sale

PHILADELPHIA DISTRICT— 1710 Market Street
Telephone Locust 5120

AUTOMATIC SCREW MACHINES

8—National Acme Mfg. Co.

Type No. 75, Automatic Screw Machine, 4 spindle, capacity of chuck 1½ in., approximate weight 5000 lbs. Location, U. S. Eddystone Rifle Storage Plant, Eddystone, Pa.

TURRET LATHES

13—Warner & Swasey Machine Co.

No. 2 Turret Lathe, 12 in. swing, 6 hole turret, automatic oil feed, with friction clutch countershaft. Location, U. S. Eddystone Rifle Storage Plant, Eddystone, Pa.

TURNING LATHES

11—National Equipment Co.

Turning Lathes, 16 in. 6 ft. bed, compound rest with 3 cone friction clutch countershaft. Location, U. S. Eddystone Rifle Storage Plant, Eddystone, Pa.

AUTOMATIC SCREW MACHINES

9—National Acme Company

Type 178, Automatic Multiple Spindle Screw Machines, 4-spindle, 3¾ in. chuck, maximum length of cut 11 in., weight 25,000 lbs., arranged for motor drive. Location, Neville Island Storage Depot, Pittsburgh, Pa.

GRINDERS

6—Pratt & Whitney Co.

Gun Barrel Drill Grinder, type small pedestal, size 8 in. x 1 in., Brown & Sharpe small geared pump and piping attached. Location, U. S. Eddystone Rifle Storage Plant, Eddystone, Pa.

CHAMBERING LATHES

8—Reed & Prentice Co.

Chambering Machine (lathe), 7 ft. bed, 8 hole turret, automatic oil feed. Location, U. S. Eddystone Rifle Storage Plant, Eddystone, Pa.

SAWS

6—Cochran & Bly Co.

No. 1 Power Cold Saw, double speed, oil pumps with 2 roller stands. Location, U. S. Eddystone Rifle Storage Plant, Eddystone, Pa.

POLISHING JACKS

3—Defiance Polishing Jack

2 polishing heads, 1 friction countershaft. Location, U. S. Eddystone Rifle Storage Plant, Eddystone, Pa.

ENGINE LATHES

1—Reed-Prentice Co.

Back geared engine lathe, 12 in. swing, 7 ft. bed, power feed. Location, U. S. Eddystone Rifle Storage Plant, Eddystone, Pa.

TIRE STEEL

Approximately 600,000 Lbs. Tire Steel

.5 x 3 x 178 in. (Bars). 4,200 lbs. Tire Steel ¾ in. x 8 in. x 16 ft. (16 bars). Analysis—C. .65-.75; Mn. .50-.70; Si. .15-.20; S. under .05; P. under .05. Location, Kurtz Bros., Bethlehem, Pa.

STEEL

Approximately 44,945 lbs. Steel Angles 5 in. x 3 in. x ¾ in., 31¼ in. long. 39,457 lbs. Steel Angles 5 in. x 3 in. x ¾ in., 33¼ in. long. Analysis—Commercial Stock. Location, Hale & Kilburn Corp., Philadelphia, Pa.

BENCH LATHES

1—Van Norman Mach. Tool Co.

Bench lathe, with compound rest, face plates, and 3 cone pulley clutch. Location, U. S. Eddystone Rifle Storage Plant, Eddystone, Pa.

The Philadelphia District also has for sale the following items, complete description of which will be found in the Philadelphia District Weekly Bulletin, mailed upon request: Blowers, Air Compressors, Motors, Transformers, Elevators, Gas Engines, Pumps, Scales, Tanks and Filters, Heine 1000 H.P. Water Tube Boilers, Steel, Brass, Copper, Bronze and many other items of Shop Equipment.

Write for Weekly Bulletin NOW.

to any District Office, See 1st page of this advertisement

WAR DEPARTMENT

ORDNANCE SALVAGE BOARD

Surplus Property Sale

ST. LOUIS DISTRICT—Missouri State Life Bldg.
Telephone Olive 6960

AUTOMATIC SCREW MACHINES

2—National Acme Co.

Type 178 Automatic Multiple Spindle Screw Machines, 4 spindle, 3 $\frac{3}{4}$ in. chuck, maximum length of cut 11 in.; weight 25,000 lbs.; arranged for motor drive. Location, Neville Island Storage Depot, Pittsburgh, Pa.

ENGINE LATHES

6—Wickes Bros.

Size 26 in. x 10 ft. Description—Standard engine lathe with tail stock and having large hand wheel but without post, steady rest, large and small face plate, lead screws and split nut and screw cutting gears. Belt drive. Location, St. Louis, Mo.

POWER PRESSES

3—Toledo Mach. & Tool Co.

Size No. 59. Description—Straight-sided hammer press with double fly wheel. Stroke of slide to be $\frac{3}{4}$ in. to $\frac{7}{8}$ in. Location, St. Louis, Mo.

ENGINE LATHES

20—Wickes Bros.

Size 26 in. x 10 ft. Description—Standard engine lathe with square tool post turret and Phoenix fourway tool posts, without compound rest, plain rest, tool post, steady rest, follow rest, tail stock, large and small face plates, lead screw, split nut and screw cutting gears. Belt drive. Location, St. Louis, Mo.

HYDRAULIC PRESSES

2—Metalwood Mfg. Co.

Size. Description—240 m/m Senior Hydraulic 6-cylinder banding press. Arranged with dies for banding 240 m/m shell, also arranged for accumulator drive but without operating valve. Location, St. Louis, Mo.

ENGINE LATHES

6—Wickes Bros.

Size, 26 ft. x 10 ft. x 10 in. Description—Special engine lathe with Phoenix square turret on cross slide without rests, tool post, face plates, tail stock and screw cutting equipment. Location, St. Louis, Mo.

POWER PRESSES

2—Toledo Mach. & Tool Co.

Size No. 58. Description—Straight-sided hammer press. Stroke of slide $\frac{3}{4}$ in. Distance between uprights 30 in. Location, St. Louis, Mo.

ENGINE LATHES

2—Wickes Bros.

Size 26 in. x 10 ft. Description—Standard Engine Lathe with standard equipment and loose change gears, tight and loose pulley, C. S. with pressed steel hangers and ring oilers. Belt drive. Location, St. Louis, Mo.

PAPER BOX MACHINES

2—Inman Mfg. Co.

Size No. 5. Description—No. 5 Subpress Tray Machine without printing presses for making boxes (paper) up to 6 in. long and 3 $\frac{1}{2}$ in. deep. Location, St. Louis, Mo.

AXLE LATHES

5—Niles Tool Works

Size No. 3. Description—Standard pattern heavy center driven double and axle lathe, machine to have four carriages to be suitable for cutting-off operations only, with C. S. with steel hanger and roller bearings. Belt drive. Location, St. Louis, Mo.

Besides these tools the St. Louis District has numerous other items of equipment, such as Furnaces, Pumps, Compressors, Accumulators, Transformers, etc. These items are fully described in the District Bulletin, which will be sent upon request.

You will be especially interested in the shop equipment items listed for sale in the St. Louis District. Write for the free Bulletin TODAY.

See first page of this advertisement for conditions of sale and list of District Offices



Bijur

Starting & Lighting Systems

Why the Bijur Shift Excels

- Positive Engagement
- Small Motor Pinion
- Backfires Harmless
- No Pinion Jamming
- No Driving Spring
- Fully Enclosed
- Not Disabled by Oiling
- Shockless
- Noiseless
- Light Weight
- Current Economy
- Cold Weather Ability
- Harmless to Press Starting Switch with Engine Running
- No Intermittent Ticking of Pinions Against Flywheel
- Found only on Bijur Starting Systems

Why the Bijur Shift is Encased

*The Case is the Driving
Element—not the Spring*

The shift is enclosed to keep out dust and dirt.

This is the shift that made the 8-tooth pinion possible—the shift that has been applied for many years to many leading makes of cars both here and abroad. Trucks, motor boats and airplanes have also found in this shift the trouble-proof element so necessary in their severe service and exacting requirements.

The Bijur Shift is permanently closed and never opened except by Bijur Service Stations, the Bijur Company is able to keep an exacting check on Bijur Systems in use under all conditions. If things go wrong the company wants to know it—a policy that provides starter insurance for all users.

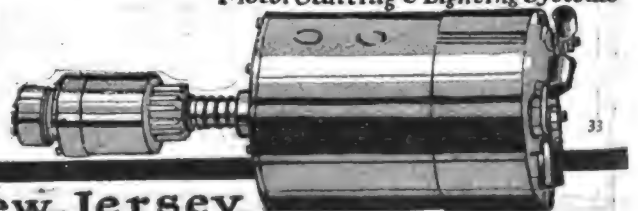
Bijur Motor Appliance Company

Hoboken



New Jersey

Motor Starting & Lighting Systems



The Annual Engineering Number

OF

AUTOMOTIVE INDUSTRIES

AUTOMOBILE

JUNE 10, 1920

THE editorial contents of this number will be particularly devoted to the trend of automotive engineering practice, design, materials, etc.

It will contain special articles by prominent authorities, information, statistics, and news of importance to **Automotive Manufacturers, Engineers, Production Managers, and other plant Executives** at the 2257 automotive factories now in active production.

This Number has the attributes of a **Reference Book**, and is usually kept and referred to throughout the year by subscribers.

It is one of the two annual Special Issues of AUTOMOTIVE INDUSTRIES, which Special Issues are published to fill the necessities of Automotive Manufacturing Executives, calling for an authoritative resumé and forecast in January and June of each year, together with a collection of facts and figures bearing upon the main features of the Industry.

This number will be in the hands of most of those who attend the Annual Meeting of the Society of Automotive Engineers at Ottawa Beach, Michigan, June 21st to 25th, 1920.

Last Forms Close June 5th

Please send in advertising copy and cuts as early as possible to

AUTOMOTIVE INDUSTRIES
U. P. C. Building 239 West 39th Street
New York City

Published by the Glass Journal Company, with branch offices at Chicago (Maliers Bldg.); Detroit (95 Fort Street, West); Cleveland (Guardian Bldg.); Philadelphia (Widener Bldg.)



Absolute Uniformity is assured in all *Johnson Bronze Bushings*

Every step in the manufacture—from the raw material to the finished product—is closely inspected and tested for definite standards of quality and uniformity.

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Our Engineering Service includes the Development of the Product, the Planning and Installing of Processes and the Designing and Manufacturing of Machinery, Tools and Equipment for Quantity Production and Interchangeable Manufacture

**ARTHUR KNAPP
ENGINEERING CORPORATION
NEW YORK**

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DEALERS

selling SUPREME AUTO OIL have no fear as to repeat orders.

¶ Customers find this well-known automobile lubricant to be all we claim.

¶ The LESS CARBON claim is conclusively proven. There is not an element of doubt in the minds of SUPREME AUTO OIL users.

¶ It is the repeat order that turns the profit. Order from our salesman or write our nearest office.

Gulf Refining Company

GENERAL SALES OFFICES:

Pittsburgh, Pa.

DISTRICT SALES OFFICES:

New York
Atlanta

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New Orleans

Boston
Houston



U. S. ARMY — Public Auctions of

Millions of Dollars' Worth of

REMEMBER THE DATE AT NEW YORK

New York, N. Y.

May 10-15, 1920

At which the following items will be offered

24 Whitney Grinders
4 Southworth Screw Machines
11 Becker Milling Machines
4 Modern Grinders

2 Shapers
5 Buffalo Forges
Chain and Crane Hoists
G. E. Motors

METALS

5,000 tons steel bars in rounds and hexagons, all sizes. Sheet copper, lead, steel and aluminum. Copper, aluminum, lead and tin ingots, spelter and babbitt. Nickel silver, 20,000 lbs. Brass, steel and copper tubing, 10,000 lbs. steel, brass and copper wire. Block tin, tubing, forgings, castings, bearings, half and half solder.

ELECTRICAL EQUIPMENT

250,000 feet cable wire; also large quantities of plain, covered and insulated wire.

HARDWARE

200,000 gross wood and machine screws. 400 Pyrene extinguishers. 600 stop watches, coiled hair, turnbuckles, shackles, rivets,

washers, complete tool sets and many other items of interest.

PAINT, OIL AND CHEMICALS

700 bbls. airplane varnish, castor oil in drums and cans and other items in large quantities.

PHOTOGRAPHIC APPARATUS

50,000 white, green and red lenses, 1 3/4 to 2 1/4" dia. 63 type E Eastman Aero Cameras, 100 type C Eastman Aero Cameras, 125 French view cameras and other items of photographic apparatus, film and chemicals.

TEXTILES

A large list of items are offered in textiles, details of which will be found in catalogue of Auction Sale.

For detailed information regarding sale

Apply: Capt. Robt. Coker, Dist. Mgr.

Mr. F. W. Weeks, Bus. Mgr.

Printcraft Building

461 Eighth Ave.

New York, N. Y.

AIR SERVICE Surplus Property



New Commodities and Materials Sales You Should Investigate

As a matter of economy we would suggest that you get in touch with our nearest office immediately.

The service rendered by our District Offices may disclose an economical source of the material you need to keep the wheels of your factory turning.

The material offered in this sale will be ready for inspection, with descriptive catalogues, May 1 to date of sale.

Catalogue sent on request.

Watch subsequent issues for details of succeeding auction sales at which other and similar material in large quantities will be offered.

THIRD SALE—CHICAGO, ILLINOIS

Sale starting May 17th. For details of this sale, apply:
Capt. E. E. McCammons, Dist. Mgr.
Mr. C. A. Pfau, Business Mgr.
1819 W. 39th St., Chicago, Ill.

FOURTH SALE—BUFFALO, NEW YORK

Sale starting May 24th. For details of this sale, apply:
Maj. J. W. Simons, Dist. Mgr.
Capt. H. S. Harmon, Business Mgr.
2050 North Elmwood Ave., Buffalo, N. Y.

FIFTH SALE—DETROIT, MICHIGAN

Sale starting June 7th. For details of this sale, apply:
Lieut. H. P. Adams, Dist. Mgr.

Mr. Geo. P. Gallagher, Business Mgr.
Aviation General Supply Depot,
Springwells, Detroit, Mich.

Send to nearest DISTRICT OFFICE for details of any sale

Separate catalogues of each Auction will be available 10 days prior to date of sale. Each catalogue will contain Conditions of Sale, Quantities and detailed descriptions of all material and equipment offered.

Send in your name to be placed on our mailing list for copies of catalogues. Any one of the Offices listed in this advertisement can give you information about any sale to be held.

Prompt Service Assured.

MACHINE TOOLS

Lathes, Drill Presses, Grinders, Planers, Furnaces, Millers, Spot-Welders and Woodworking Machinery.

ELECTRICAL EQUIPMENT

Motors, Generators, Motor-Generator Sets, Transformers, Wire, Cable, Conduit and Lighting Fixtures.

METALS

Steel, Brass, Copper, Aluminum, Scrap.

MOTOR ACCESSORIES

Airplane and Engine Parts and Obsolete Planes and Engines.

SHOP EQUIPMENT

Shafting, Belting, Pulleys, Bearings, Drop Hangers, Couplings.

CHEMICALS—PAINTS—OILS

Varnishes, Shellacs, Dry Paints, Mixed Paints, Turpentine, Oils, Castor Oil, Dryers, Lacquers.

FABRICS

Cotton, Linen, Leather, Fabricoid, Felt, Cord, Thread, Tapes.

HARDWARE

Screws, Bolts, Nuts, Spikes, Nails.

MISCELLANEOUS

Contractors' Equipment, Containers, Drums, Building Materials, Fire Protection Equipment, Kitchen and Camp Equipment, Hoists,

Plumbing Supplies and Fixtures, Leather and Rubber Goods, Hemp and Jute Products, Clothing, Shoes and other miscellaneous material.

Full Particulars of any District Auction may be obtained from

C. S. Shotwell, Bus. Mgr.
Material Disposal and Salvage Div.
U. S. Army Air Service
Washington, D. C.

Smith & Jaffe, Auctioneers
68 West 45th St.
New York
N. Y.



A New Giant in the Gear Shop World

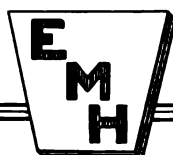
The new Differential Gear Shop of the General Motors Corporation, in Detroit, is a dominant example of modern saw tooth factory construction, and, with its remarkable mechanical equipment, the finest of its class in existence.

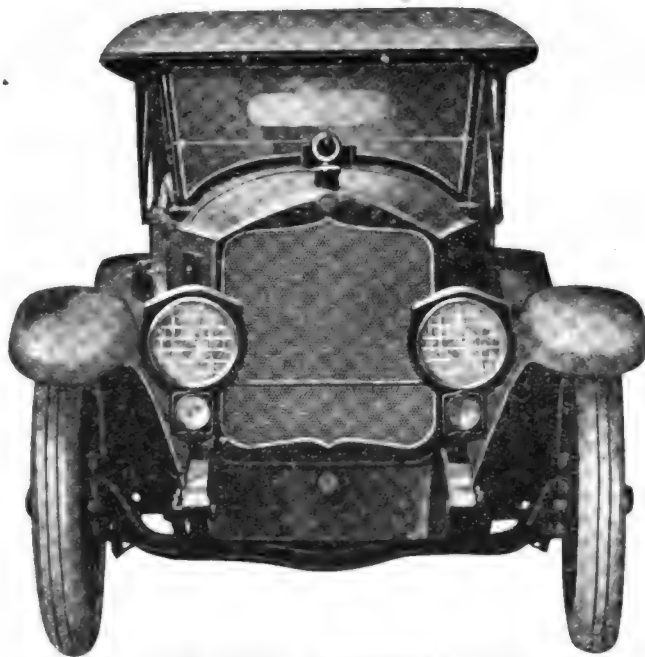
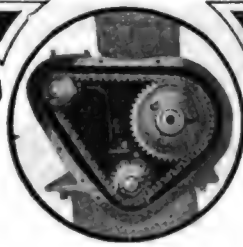
As will be noted in the illustration, a two story office section extends along the entire 360 foot frontage, while the Gear Shop and Heat Treating Departments stretch away to the rear, nearly an eighth of a mile.

Possibly you will be interested in a detailed description of this enormous gear fabricating plant. It is yours upon request.

Engineering and Architectural Service Based Upon the Broad Foundation of Knowledge and Vast Range of Practical Experience.

Kindly Address: 810 Marquette Building.





THE NEW NATIONAL "6"

A Series of Announcements

We take great pleasure in announcing that the new National "6" is equipped with the MORSE front end drive.
Make your product better by joining the ranks of the famous car makers who use the MORSE front end drive.

Write Detroit Office for 1920 Diary and Memo Book. Give Firm Name, Position

MORSE CHAIN CO. Largest Manufacturers of Ithaca, N. Y.
silent chains in the world

Detroit Office and Display Room, 1003 Woodward Avenue



The Field and
The Medium**El Autom
Americano**

AUTOMÓVILES · CAMIONES · MOTO-CICLETAS · AEROPLANOS · TRACTORES

No. 4 No. 4

NUEVA YORK, Abril, 1920

Precio \$2.00 31 1918

Latin-American
Automotive Trade
and
*El Automovil
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printed in Spanish exclusively.****Reaching the automotive trade in:**

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Brazil	French W. Indies
British Guiana	Haiti
Chile	Jamaica
Colombia	Mexico
Ecuador	Philippine Is.
Paraguay	lands (Spanish
Peru	speaking trade
Uruguay	only.)
Venezuela	Porto Rico
Azores	Spain
Barbadoes	Trinidad
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Central America	ish speaking
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Here is a rich and growing market for the American Automotive Manufacturer—NOW open wide but which later on will have fought for against the forts of the fast-retries of Europe. Americano will make business connections will be of inestimable hard days be faced.

THERE is only one way of merchandising American Automotive products in Latin-America, and that is through the Dealer.

THERE is only one automotive export paper published exclusively in Spanish and going direct to the automotive dealers and distributors of Latin-America and that is, EL AUTOMOVIL AMERICANO.



Published by

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Spicer

UNIVERSAL JOINTS AND PROPELLER SHAFTS

Grease-tight, dust-proof, with all parts interchangeable, Spicer Universal Joints and Propeller Shafts have, since 1904, met with ever-widening engineering approval. Today over one hundred and twenty-five of the leading automobiles and trucks are Spicer equipped.



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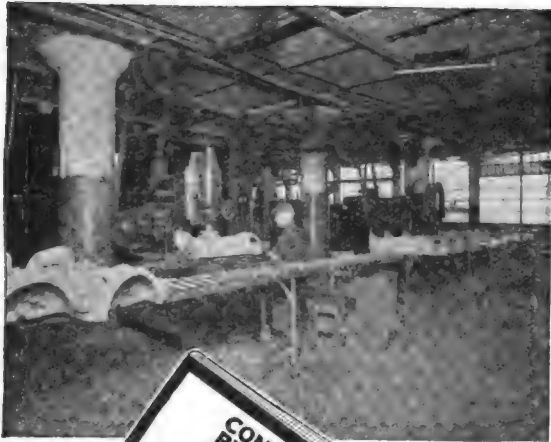
Sales Representatives:

L. D. Bolton, 2215 Dime Savings Bank Bldg., Detroit, Mich.

A. H. Coates, 41 Spear Street, San Francisco, Cal.

Export: Benjamin Whittaker, Ltd., 21 State Street, New York, and
56 Ludgate Hill, London, E. C. 4.

Lamson Conveyors



Picture shows view in plant of Fuda Engine Co., Harvey, Ill. Engine parts are just one of the many products carried by Lamson Conveyors. Send for a copy of new edition of "Conveying by Gravity" for complete information.

Many Machines Operating as One

You would not think of using many hand-operated machines when one automatic machine will do the same work far better and quicker. Then why treat machines as separate units, when Lamson conveyors will unite them into a single operating unit?

Finished work from each machine is carried on to the next operation automatically and at once. Workmen are not obliged to wait for raw materials but have a supply of parts constantly at hand. Nor are they impeded by an accumulation of finished parts which are only in the way.

Lamson Conveyors keep the stock in process down to a minimum by keeping it moving from operation to operation. Parts are in work practically all the time, not in idle semi-storage at machines.

A Lamson representative will be glad to visit your plant and show you how Lamson Conveyors will help you. Ask him also to demonstrate the rugged simplicity of Lamson conveyor construction. If you prefer, send for our book, "Conveying by Gravity." In either case there is no obligation.

THE LAMSON COMPANY

BOSTON, MASS.

BRANCHES IN THE PRINCIPAL CITIES

DETROIT, 97 WOODWARD AVE.

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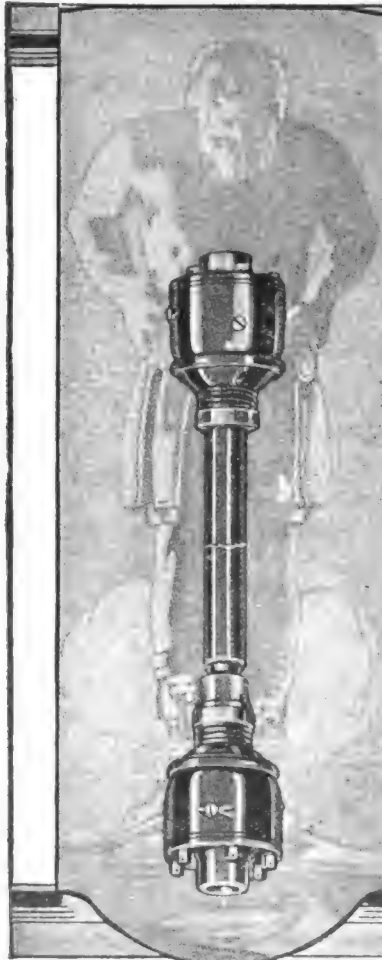


Hartford

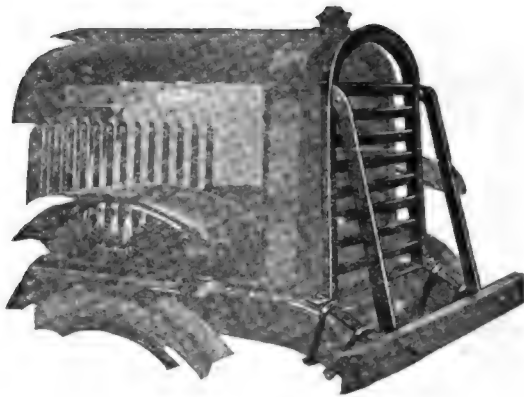
UNIVERSAL JOINTS AND CONE CLUTCHES

*The Joint of
Universal Satisfaction*

The Hartford Automotive Parts Co.
Hartford, Conn. Incorporated 1906



The Necessity for Adequate Radiator Protection Increases Rapidly. The Warman Radiator Guard Should Therefore Become a Necessary Part of Every Truck



Rapidly increasing motor truck traffic is rapidly running up the list of accidents. A broken radiator costs its owner not only the price of a new one or expensive repair bills, but most important, it costs the days and weeks of idleness.

Therefore trucks equipped with the Warman Radiator Guard have a big added selling argument on the front end.

Note the forward brace. It takes up and deflects blows. If the force of collision is great enough to deform the brace the guard is thereby pulled forward instead of being pushed back against the radiator.

The lateral bars are set at an angle of 45 degrees. If the brace, the "first line of defence," should give way the bars would flatten against the core—not cut into it. These bars also protect against projecting bars, rods and wagon tongues.

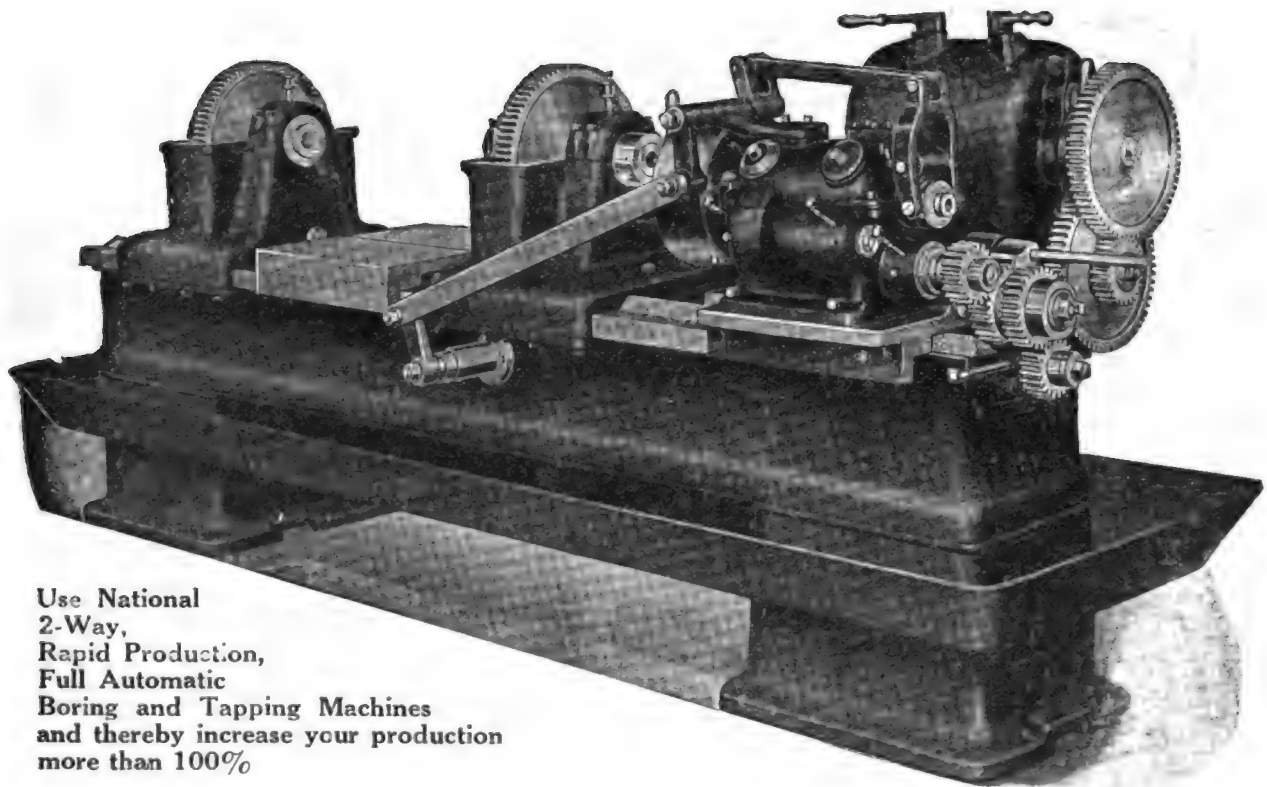
Our equipment for producing Warman Guards is extensive. We build both goose-neck and bumper types covering practically every truck design. Granting the importance of equipping with this part, we will show why we can build better, stronger guards than can any other guard maker, and also that we can turn out this quantity production on a cost basis impossible with any truck manufacturer.

Write to our engineering department.

The Fundamental Corporation

270 Union Ave., Brooklyn, N. Y.

The WARMAN RADIATOR GUARD



Use National
2-Way,
Rapid Production,
Full Automatic
Boring and Tapping Machines
and thereby increase your production
more than 100%

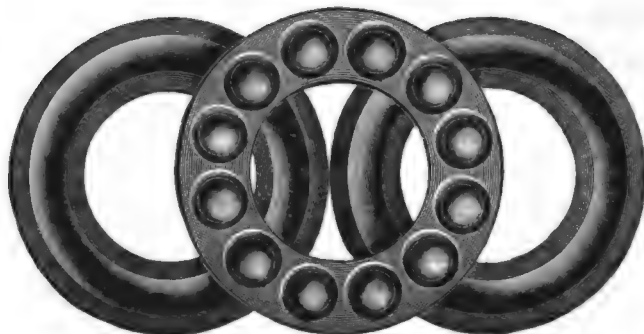
THE NATIONAL LATHE CO.

CINCINNATI, O.

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As Far As We Know, the **NC-4** Did Not Have Any **BANTAM BALL THRUST BEARINGS**

**20
YEARS
EXPERIENCE**



**20
YEARS
SUCCESS**

—but they have been used for twenty years with absolute satisfaction and success in the leading Automobiles, Trucks, Tractors, Aeroplanes, Motor Boats, Gas Engines and Machine Tools.

Made in the United States

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A booklet containing over 130 addresses of holders of patented ideas, to be manufactured on a royalty or some other satisfactory arrangement. It will be sent free to manufacturers. No postal card requests recognized.

Contract Work Service Department,
AUTOMOTIVE INDUSTRIES.

ARE You machining from solid stock when you could stamp or draw to size more economically?

Lots of folks who have done this in the past are now using metal stampings made on "BLISS" Presses.

We do *not* make stampings but we can tell you who does and—better still—we can give you the names of just the firms best fitted by experience and equipment to do exactly the thing you need.

Ask us—but don't forget to include a sketch and description of the article or parts



1857
LONDON

E. W. BLISS COMPANY

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CINCINNATI, Union Trust Bldg.

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Built Upon a Solid Foundation of Truck Knowledge

Technical theory alone could not produce Iron Mountain Worm Drive Axles. Experienced motor truck engineers are responsible—from actual contact with truck service conditions—for their perfection to the present state. We believe they represent the acme of axle construction.

The principles of design in Iron Mountain Worm Drive Axles are thoroughly proven and rest upon a solid foundation of practical personal knowledge gained by years of development and experiment.

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We show specifications and detailed descriptions of Iron Mountain Worm Drive Axles in a book your engineer will be glad to have. May we mail a copy?
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JACOBS CHUCKS
Standing Equipment

LICENSED UNDER
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MOTOR PATENT

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UNIVERSAL ELECTRIC DRILLS SAVE 80% IN COST OF DRILLING

A broad statement. But if you knew—as many leading automotive manufacturers already know—the speed, accuracy, durability and economy of THOR Drills, you would not question it.

THOR super-power is made possible by several exclusive THOR features. Perfect workmanship is responsible for THOR accuracy and durability. And economy naturally follows.

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This old maxim surely applies to the one-piece steel core used in the Standard Commutator. There are no rings, no screws, no nuts, no bolts and no rivets to loosen.

The Standard Commutator is built to withstand the rough handling to which commutators are sometimes subjected when forced upon the shaft or while being assembled with the armature and other parts of the motor or generator.

We are supplying some of the largest commutator users in the country, and are constantly increasing our production. We are delivering one hundred and ten thousand Standard Commutators to one consumer alone. If you

are in the market for commutators we will gladly have our representative call upon you. Designs to suit your requirements, together with prices, will be promptly submitted upon request. Send us your specification.

The Toledo Standard
Commutator Co.

Toledo, Ohio.

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STANDARD COMMUTATOR

Flexible Propeller Shaft Assemblies for Passenger Cars, Trucks, Tractors and Motor Boats

Protect engine and transmission parts from the road shocks and vibration, which are naturally transmitted up the propeller shaft, and take the severe strains of starting, stopping and braking off the driving mechanism in the rear axle.

The Sneed shaft is of light-walled, nickel steel tubing, electrically heat treated. It is remarkably strong and unusually resilient.

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The disk carrying spiders are shrunk on the tubular shaft, secured by a hexagonal wedge and welded.

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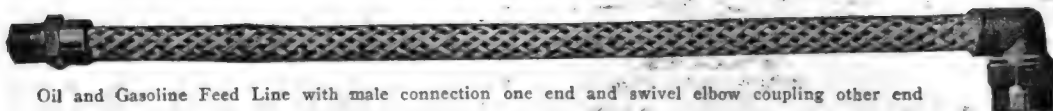
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An All-Metal Flexible Tube that Guarantees High Efficiency on Automotive Vehicles so equipped.



Oil and Gasoline Feed Line with male connection one end and swivel elbow coupling other end

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withstands the constant weaving of the frame, which is present in all motor driven vehicles, as well as vibrations due to the engine and to road shocks.

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contains no packing and is positively pressure tight for gasoline, oil and air.

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**THE MOST
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Light in weight, will not blister or crack.

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By so doing he gains the car owner's Good Will, because Duxrane is waterproof and wear-proof, giving dependable year in and year out service.

Send for a sample and give it the scrub test.

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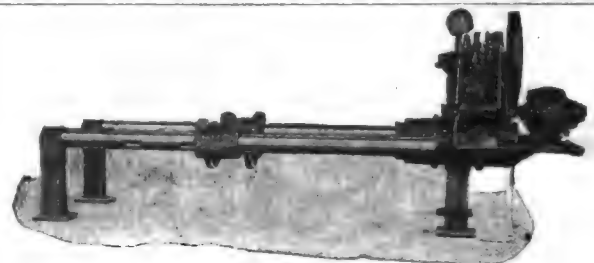
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FOR RAPID ASSEMBLING OF FORCE FIT PARTS

This is a handy type of press for forcing gears, sleeves, bushings and other shop operations requiring accuracy.

It has a capacity of 200 tons; maximum opening, 30x84 inches. Its open horizontal construction allows placing of work either from the floor or overhead crane.

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214

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He must possess the following qualifications: He must, by actual experience, be a modern Production Man. He must therefore be able to make authoritative decision on factory equipment, material and capital necessary to produce a predetermined number of trucks at a profit.

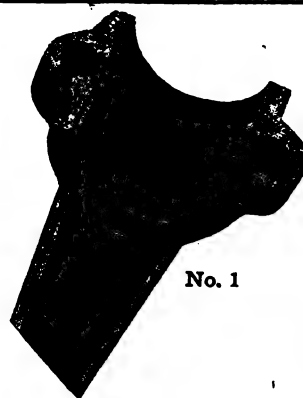
He should be comparatively young and preferably a man who is now understudy to a big executive, and who feels himself capable of handling the most important executive position of a fast-growing motor truck manufacturing organization.

The man we have in mind is ambitious to become a vital factor in the growth and development of a company with which he expects to stake his future.

To such a man is also offered the opportunity, if he so elects, to become financially interested on a basis which will make the results of his efforts particularly attractive. Correspondence will, of course, be held in strictest confidence.

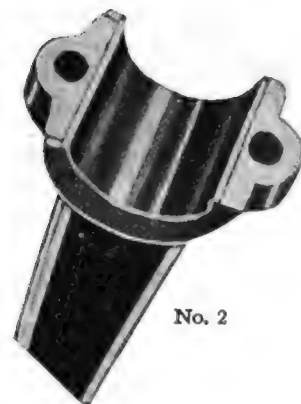
A. W. L., care of Automotive Industries,
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SAFE SPEEDY



No. 1

No. 1. A first-class scraped bearing with 50% bearing surface.



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No. 2. A 100% bearing produced by Timesaver method in less time.

Timesaver Bearing Fitting Compound Made the Difference Between No. 1 and No. 2

Every day Timesaver is being used in place of hand scraping in thousands of automotive plants to produce more and better bearings. Much faster than any other method to produce a perfect finished bearing that needs no "running-in." A prominent manufacturer of marine engines wrote us: "We are so far ahead on bearing work, we have had to take the men off and put them on something else." A large tractor manufacturer writes: "Without any change in tools our men have increased bearing production 45%, and have also entirely eliminated the necessity for running-in, the bearings being finished perfect on the assembly floor."

Timesaver can do no harm to any part of the motor even if not entirely cleaned out as it becomes inoperative in a few minutes.



*Eliminates
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*A Sure Production
Raiser*

Using Timesaver is sure, safe and easy. Simply rough-scrub or ream bearing until shaft bottoms, then apply Timesaver compound to bearing surface. Bolt on caps, turn shaft about three minutes and you will have a perfect bearing. Send for full information today. Total cost of material does not exceed 50c. per motor. Send us your trial order. We want you to know just what Timesaver will do for you in your factory.

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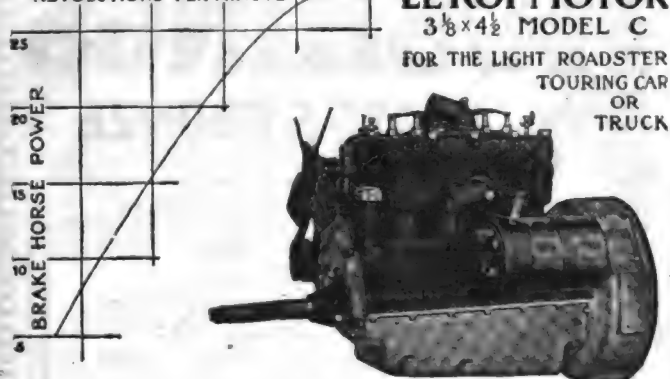
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REVOLUTIONS PER MINUTE



LE ROI MOTOR
3 1/8 x 4 1/2 MODEL C
FOR THE LIGHT ROADSTER
TOURING CAR
OR TRUCK

Used by leading manufacturers of best-known American-made light trucks.

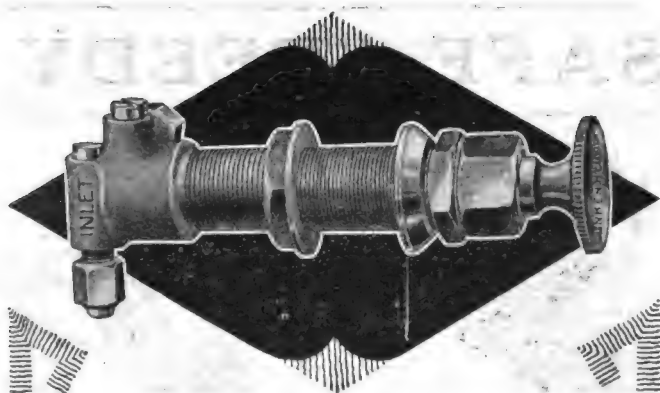
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LUNKENHEIMER
Gasoline Engine
PRIMER

Makes starting easy, regardless of the grade of fuel or atmospheric temperature because it injects a charge of atomized gasoline directly into the intake ports, giving a power impulse on the first turnover.

It saves the starter battery, makes priming a safe and convenient operation, and prevents the accumulation of carbon in the cylinders, caused by the excessive use of the carburetor choke.

The Lunkenheimer Primer is easily attached, connections being furnished for all makes of cars. Its installation means safety, convenience and economy.

Leading dealers everywhere sell Lunkenheimer Primers. Write for descriptive booklet No. 513HJ.

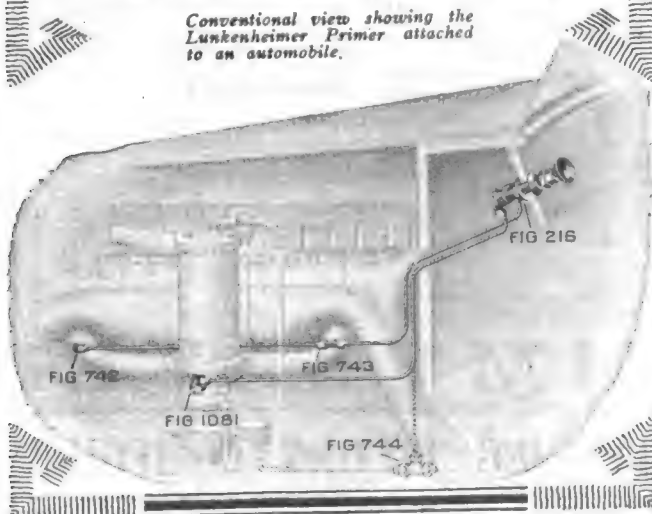
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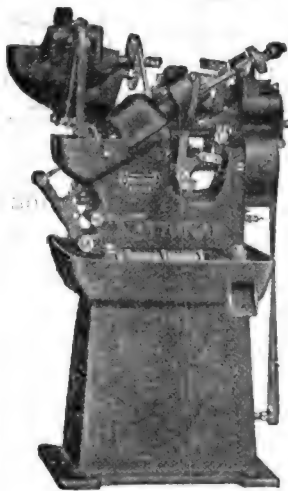
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Prompt delivery, combined with high class workmanship, is very desirable—but right now, both are very hard to obtain.

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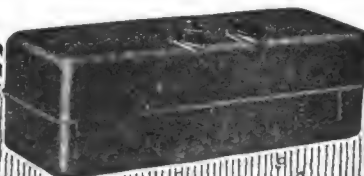
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—specialized products and exceptional manufacturing facilities—invaluable to them.

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Send us a sample or blue print and let our special Tank Dept. furnish you with an estimate.



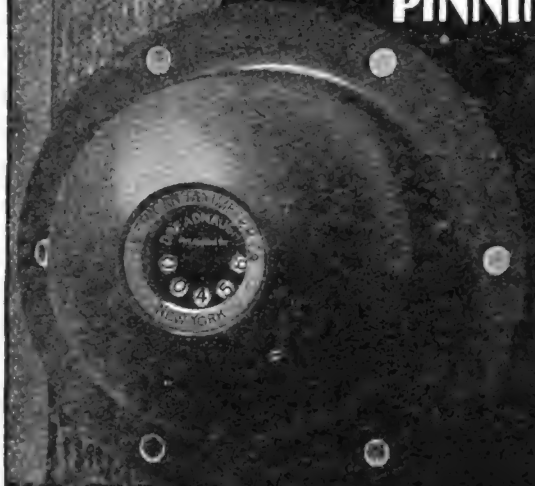
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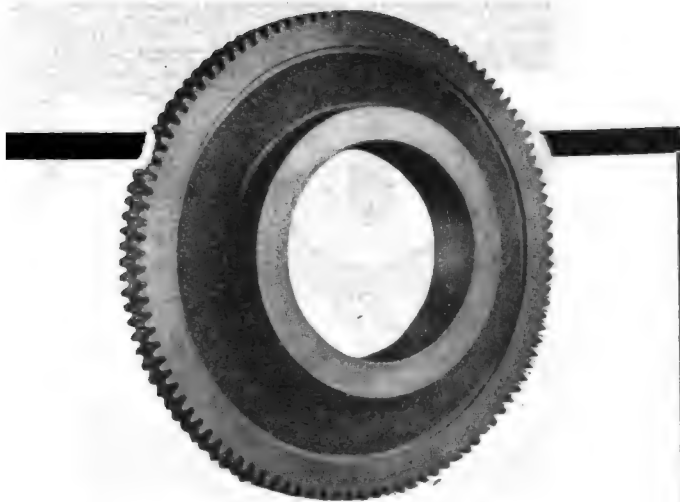
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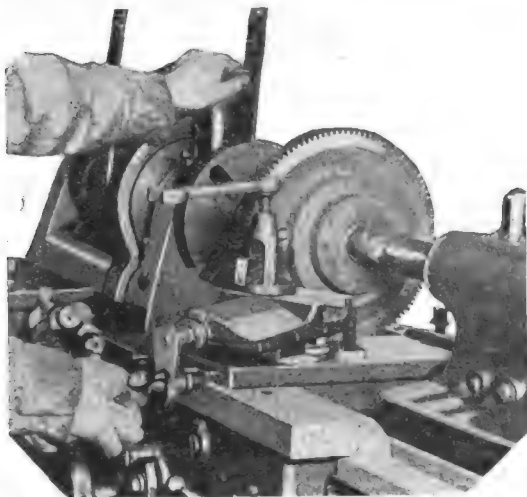
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There are few super-accurate machines which can be depended on to produce in quantity. But here is the HENDEY boring, turning and facing gear blanks, making a speedy, accurate production job of it at the Acme Manufacturing Company, Boonton, N. J.



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District Offices: New York, Cleveland,
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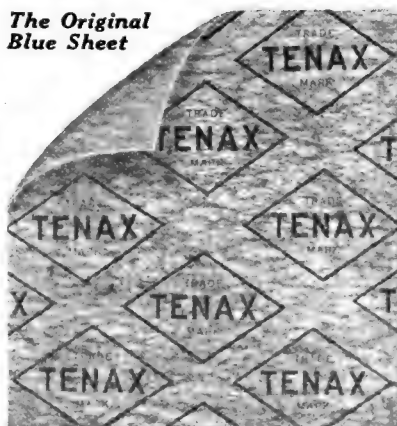
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Ask your Jobber or write us now for prices and small sample.



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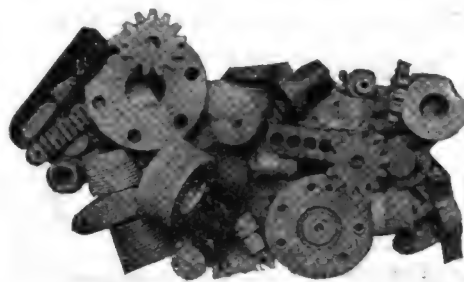
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You get the kind that you want when you want them if your specifications call for Stromberg-Carlson permanent magnets. We specialize in the quantity production of high quality permanent magnets for the electrical and automotive industries. Let us figure upon your requirements.

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Vul-Cot Fibre is especially adapted to the making of insulating parts that must also function mechanically.

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It not only outwears other fibre, but it is far easier to drill, thread, saw or machine, for it has no soft or hard spots or fissures.

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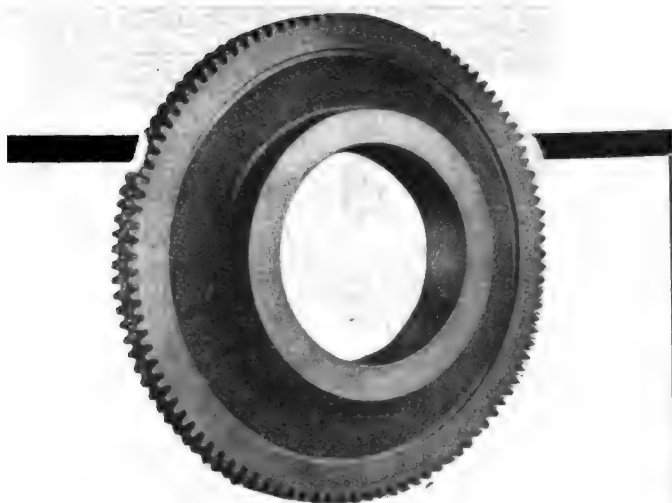
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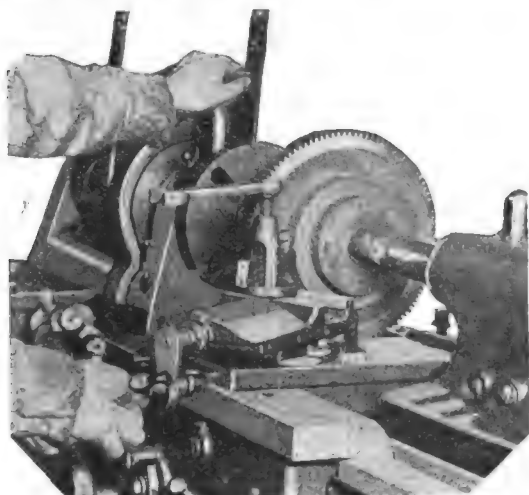
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Fast and Accurate Gear Turning on a Hendey

There are few super-accurate machines which can be depended on to produce in quantity. But here is the HENDEY boring, turning and facing gear blanks, making a speedy, accurate production job of it at the Acme Manufacturing Company, Boonton, N. J.



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again proved their ability to turn out the finest in precision work and on a quantity basis. Get a letter off to us today for HENDEY catalogs—they will give you new ideas on tool room equipment.

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The most simple and most efficient lettering pen for freehand lettering. It writes with a steady, smooth, velvety touch.

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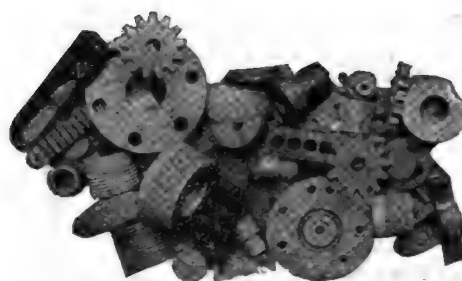
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S. A. E. Open Hearth Alloy
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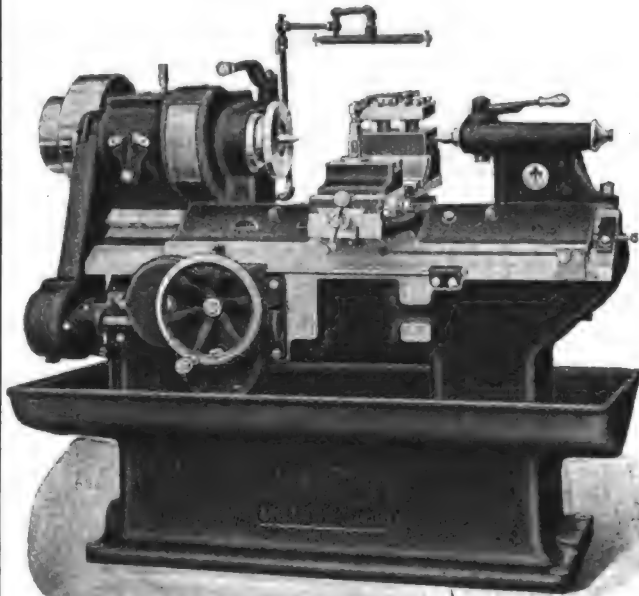
PERMANENT MAGNETS

You get the kind that you want when you want them if your specifications call for Stromberg-Carlson permanent magnets. We specialize in the quantity production of high quality permanent magnets for the electrical and automotive industries. Let us figure upon your requirements.

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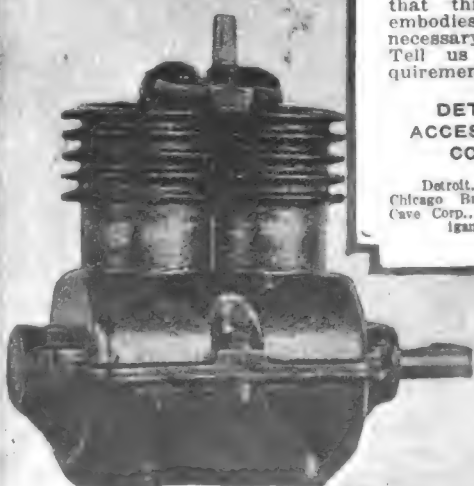
HEAVY DUTY TRUCK MODEL

Inflation of giant pneumatics from 8" diameter up, necessitates a pump of unusual design and sturdiest construction.

A test will prove that this pump embodies all these necessary features. Tell us your requirements.

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CORP.,**

Detroit, Michigan.
Chicago Branch: Miller-Cave Corp., 122 S. Michigan Ave.

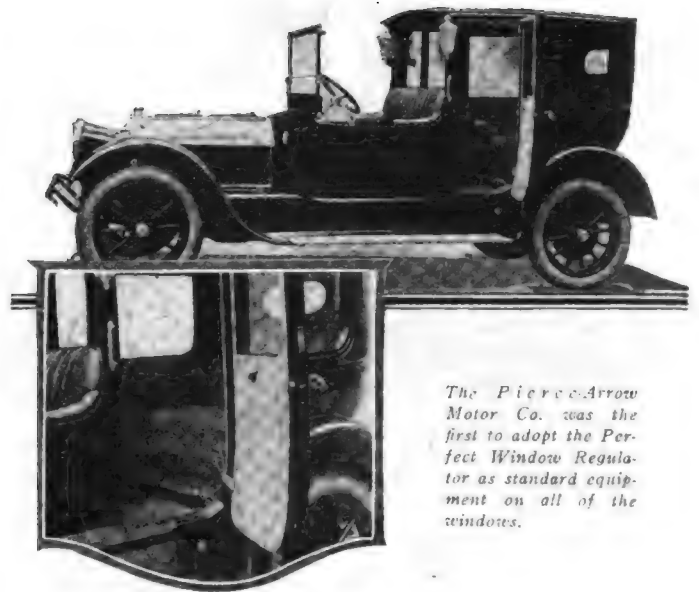


The Grinding Wheel and the Automobile

GRINDING is utilized to lessen friction losses in the driving mechanism. The first link in the chain is the connecting rod which carries the power from the wrist pin to the crankshaft. First the wrist pin is ground. Then the bushing, usually of bronze, in the wrist pin end of the connecting rod is ground.

Alundum wheels, grain 46, grade M, have proved excellent on the wrist pin operation.

Norton Company
Worcester, Mass.



The Pierce-Arrow Motor Co. was the first to adopt the Perfect Window Regulator as standard equipment on all of the windows.

—and now the Perfect Regulator for the rear quarter window has been made a necessity on all fine cars.

THERE was a time when an excuse could be offered for the use of the antiquated window strap on the rear quarter, for then there was nothing better to operate this window. This was before the Pierce-Arrow had adopted the Perfect Window Regulator—nearly ten years ago.

But today fine car owners look upon the rear quarter regulator as standard equipment. And no wonder, as it is so easy—so simple to operate the window with the Perfect Window Regulator instead of pulling and tugging at a strap.

The Perfect Window Regulator operates easier than any other device because it is constructed so that the window's descent stores energy to aid in raising it again.

Specify the Perfect Window Regulator on your next new model—on all of the windows.

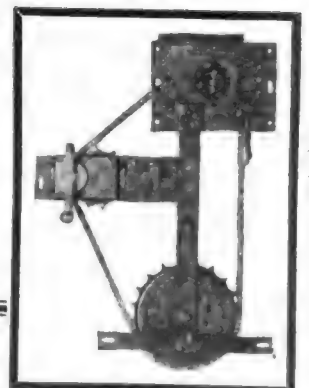
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Perfect Window Regulator Co.

20 Exchange Place
New York City

Foreign Branch, H. M. Hobson, Ltd., London

These builders of fine bodies recommend the Perfect Window Regulator: Ruby, Thompson, Holbrook, Healy, Walker, Wells, Robbins Body Corp., Kimball, Biddle-Smart, Blue Ribbon, Fleetwood, Locke, Racine, Lang Body Co., Sedan Body Co.



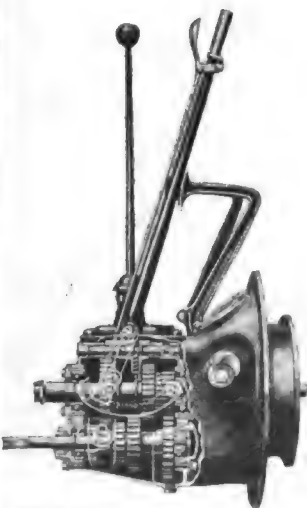
**Perfect
Window Regulator**

DETROIT TRANSMISSIONS

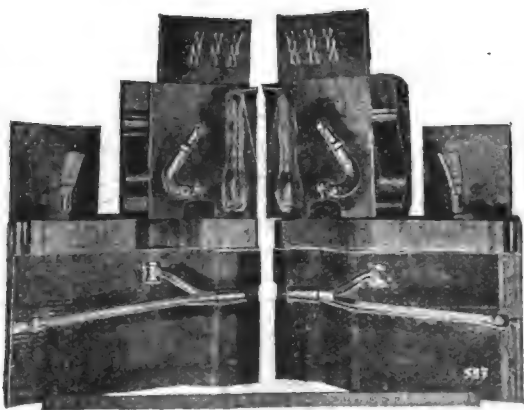
**FOR
TRUCKS**

Unit Power Plant
Type for Trucks of
1, 1½ and 2-Ton
Capacity—3 Speeds

**Detroit Gear &
Machine Co.**
Detroit, Michigan



Model C



All the Dies you want when you want them by the Keller method

The Keller *Automatic* Die Sinking Machine speeds up production by affording a means of keeping the die supply up to the demand. It eliminates the tiresome and difficult part of die cutting.

Keller Automatic Die Sinking Machines have solved the die problem successfully for many industries. More than 50% of the machines bought within the past twelve months were repeat orders.

Tell us what you make and let us send you interesting facts and photographs covering Keller Automatic Die Sinking Machines—How they're used—who uses them and what they're doing for others in your line.

**KELLER MECHANICAL
ENGRAVING COMPANY**
66 Washington St., Brooklyn, N. Y.

KELLER AUTOMATIC DIE SINKERS

KME-13



75% of This Counterbore Lasts Indefinitely and has But One Initial Cost

The Cost Cut Counterbore consists of a holder, a cutter, a pilot pin, pilot bushing and set screw. The cutter is the only part subject to wear and this can be reground to the last ounce of metal. Think what this means in tool cost, entirely aside from the 15% to 50% increase in production by the use of this tool.

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Counterbores Exclusively
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Our Complete Stocks Located in Six Modern Warehouses
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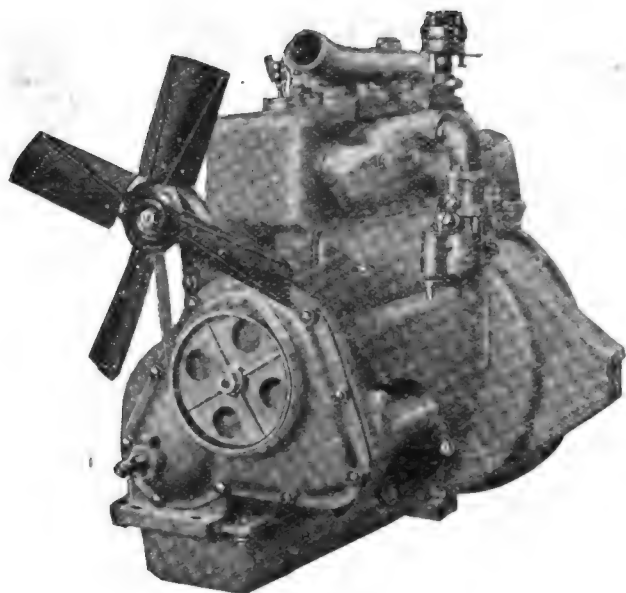
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MODEL L—3½x5—ENGINES—MODEL O—3x5
37½ H.P.—2200 R.P.M. 27½ H.P.—2250 R.P.M.

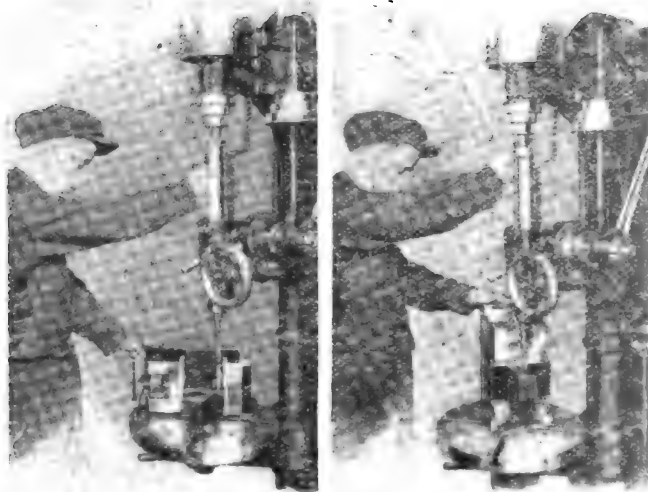
Oiling is by gear pump to all bearings.
 Cooling, either thermo-syphon or pump for heavy duty.
 Ignition, mounting at rear for magneto or distributor.
 Starter mounting, right side No. 2 SAE Flange, to flywheel housing.
 Generator mounting, left side No. 2 SAE Flange.
 There is nothing freakish about these motors, still they are great in their simplicity, and reasonable in price.

TURNER & MOORE MFG. CO.
 DETROIT, MICH.



YOU see them everywhere! For Armstrong Tool Holders are used wherever metal is turned or planed. All sizes and forms.

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THIS vise is flanged on all surfaces and machined true and square. Vise can be used in five positions, working equally as well on sides, ends and bottom. It can also be fastened on lathe face plate.

Use the NESTOR 7 feature Vise.

1. Quick acting jaw.
2. Unusual capacity for overall length.
3. Machined on Five surfaces so that work can be drilled at right angles without the need of removing work from vise.
4. Jaw can't "cock up," clamping device above center exerts downward pressure.
5. Hardened and ground jaw facings are readily removable for special work.
6. Flange entirely around base for clamping to machine table or lathe face plate.
7. Handle or wrench permanently attached to avoid loss or delay.

Writing for prices will not obligate you in any way.

Nestor Manufacturing Company
 40 West 13th St. New York City



Nestor Quick Acting Machine and Drilling Vise. Four sizes. 2½, 4, 6, and 9 inches. Also made with swivel base.

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NATITE is 100% Artificial Corundum. It is used for manufacturing grinding wheels, for metal polishing purposes, on belts or in any manner in which emery or any other abrasive is consumed.

NATITE is packed in kegs containing about 350 pounds each. We can supply any size from 8 to FFF inclusive.

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USE NATITE and CUT YOUR FINISHING COSTS!

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Thomson Spot Welder Co.

Lynn, Mass.

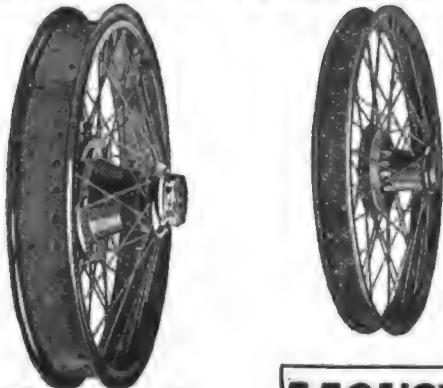
Electric Butt Welding

Should interest you as a progressive production expert. Thomson Butt Welders, the original type of this apparatus, have been on the market for over twenty-five years, and giving the utmost in satisfactory service. Forge fires, anvils, and hammers dispensed with. The metal becomes white hot and plastic in a few seconds, and then pressure applied and the metals are united permanently.

Thomson Electric Welding Co.

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WIRE WHEELS



HOUK
WIRE WHEELS

We can supply immediately, sets of Houk Wire Wheels for all the cars listed and any of the service stations below will gladly install them.

Dealers should send at once for the particulars of our service and sales agency proposition.

Buick	Dort	Lexington	Paige
Cadillac	Essex	Marmon	Scripps-Booth
Chalmers	Franklin	Maxwell	Studebaker
Chandler	Haynes	Moon	Stutz
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Cole	Hupp	Oldsmobile	Westcott
Dodge	Kissel	Overland	Winton

HOUSE
WIRE WHEELS

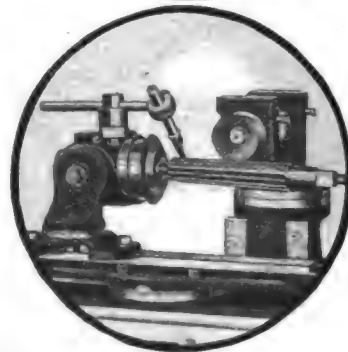
Set of 5 House Wire Wheels, 4 inner hubs, 4 hub caps, hub cap wrench, spoke nipple wrench. White, Black, Red; color optional. For FORDS, \$70.

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(Successor to Houk Manufacturing Co.)

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Grinding Face of Teeth on Taper Reamer

The centers are brought in line with the face of the grinding wheel and the work-head raised to bring bottom of the tooth parallel with table. Tooth rest is clamped on top of work-head and adjusted to bear against the heel of the tooth. This method insures rapid handling and super-accuracy.

The Oakley No. 2 Grinder not only sharpens rapidly and accurately any style of saw, milling cutter, tap, etc., but with complete attachments will handle any cylindrical, internal or surface grinding job within its range.

In fact, this machine will handle any and all grinding jobs found in a tool-room. Unusual rigidity and convenience in operating makes for the speedy handling of super-accurate work. Write for bulletins TODAY.

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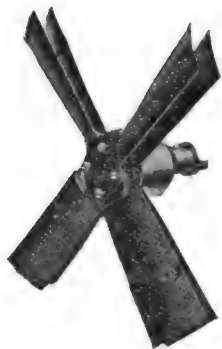
Cincinnati

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The **OAKLEY NO. 2**

DETROIT MULTIBLADE FANS

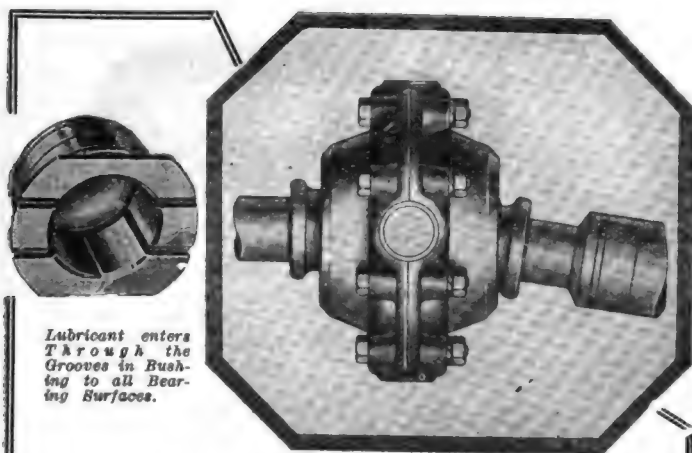
The Hurricane Under the Hood



High velocity air movement through the radiator. Extreme light weight coupled with unusual strength and rigidity.

Let us know your requirements for passenger cars, trucks or tractors.

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Through the
Grooves in Bush-
ing to all Bear-
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All Bearing Surfaces Are Flooded with Oil

The only metal-to-metal Bearing Surfaces in the A. B. Universal Joint are the four bushings or bearings. These are constantly flooded with oil. The centrifugal force, which results from the rapid rotation of the joint, throws the oil into the grooves in the face of the bushing. (See cut.) It is compelled to rush inside the bearing and lubricates the only metal-to-metal bearing surfaces found on the A. B. Joint.

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SOUTH EASTON, MASS.

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Centrifugally Forced Lubrication

ATLAS

CAP AND SET SCREWS

Are Strong



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Furnish your help with these wiping cloths for all wiping and polishing jobs. They can also be used instead of towels. They will save you money.

Mireco cloths are carefully selected remnants of cheese cloth, flannels, toweling, blanket end, etc., from the largest cloth mills in the country. They are all clean and new—cut in convenient lengths, ready for use.

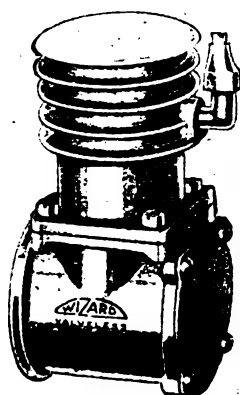
Write us to-day for samples and prices. You can then order the grade of cloth most suitable to your needs.



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**Power Driven Pump
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Trucks
Using
Tires Up to
38 x 7**

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"Forc" Oil Cups

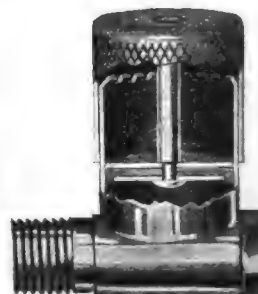
A POSITIVE LUBRICATING DEVICE, that FORCES the oil in and around the surface requiring lubrication.

"FORC" OIL CUPS have met the demand of Automobile Owners for a simple, inexpensive and positive lubricating device.

A FORCE FEED OIL CUP that is DUST, DIRT, AND WATER PROOF, and PRACTICALLY INDESTRUCTIBLE.

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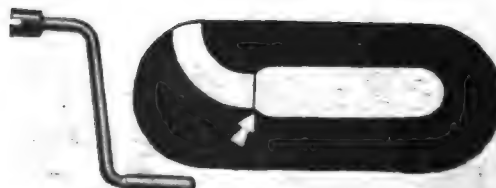
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Rugged—Oversized—Lasting

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We have a dealer plan that is extremely liberal in its terms and we back it with service that will hold and build trade. Write for it.

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The edge of the grip is always spun down—there are no projections to injure the hands

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There are two main reasons for the wide usage of Cincinnati Starting Cranks—their superior construction and the one-piece spun-over grip.

The crank itself is made of special analysis steel. The one-piece spun-over grip has no projections to injure the hand; it is dust-proof and revolves freely at all times.

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INCREASE THE EFFICIENCY
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This Improved Parallel Ruler Attachment does away entirely with watching the head of the "T" square to make sure that it is always against the edge of the board, thus enabling the draftsman to work with greater speed. It is absolutely accurate.

This attachment makes for greater efficiency and consequently greater drafting production. Write for complete details.

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For further information see pages 165 to 173 of this Week's issue.

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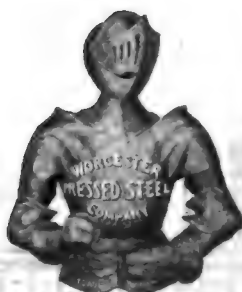
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Lighting
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It Cures Bearing Troubles.

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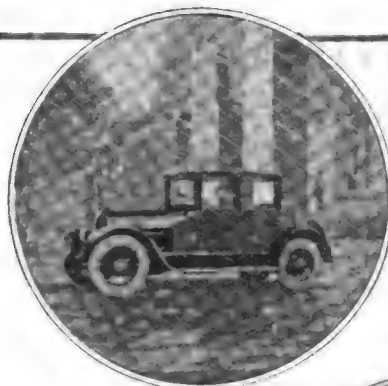
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Drenching
Rain
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Punishing
Heat

The Hilo Baked Japan Finish on fenders, hood and radiator shell stands up for years under these gruelling weather conditions. It does not lose its bright, lustrous finish.

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Equipped with Hyatt Bearings throughout. Made in various types, hand and pneumatic, in capacities up to 20,000 pounds and in spans up to 40 feet. All parts are extra strong, without excess weight.

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Cleveland, Ohio

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This Company manufactures Sheets adapted to every phase of the industry, Auto Body Stock, Fender and Hood Stock, Crown Fender Stock; also material for Tanks, Guards, Radiators, Frames, etc. "THURITE" Deep Drawing Stock—remarkable for its drawing qualities and behavior under dies. Write us for full information on Deep Drawing Stock, Enameling and Japanning Stock, Black Sheets of every description, Galvanized Sheets, Formed Roofing and Siding Products, Tin and Terne Plates, Black Plate, etc.

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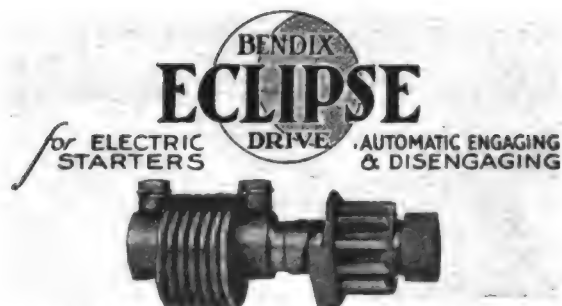
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Specialists in **THREAD**
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"NORMA" MAGNETOS
PRECISION and
BEARINGS LIGHTING
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"The Scientific Detector"

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Size plainly cast on each Cut-Out. Neat in appearance and thoroughly serviceable—is guaranteed to make good. Made in 1½" to 3¼" sizes. Manufactured by

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(ALL METAL IN SHOT FORM)

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"The Homeopathic Cure for All Metal Ills"

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Manufacturers of

**BRIGHT FINISHED STEEL SHAFING,
SCREW STEEL, CHROME NICKEL and
CHROME VANADIUM STEELS in
FLATS, SQUARES, ROUNDS,
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for Cylindrical, Surface, Internal, Tool and Cutter
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Made in 3 Sizes

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Fitchburg Grinding Machine Co.

Fitchburg, Mass., U. S. A.

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Cuts The High Cost of Motoring

LUBRICATE gears and bearings with NON-FLUID OIL and you will give them better protection from frictional wear, reduce your repair bills and get better lubrication at less cost per month.

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At your dealers.
In the orange can.

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motor to fit—
your requirements

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Portable Electric Drills
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These devices have exclusive advantages of design and construction.

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By Reputation — "The Best Cam Shafts Made"



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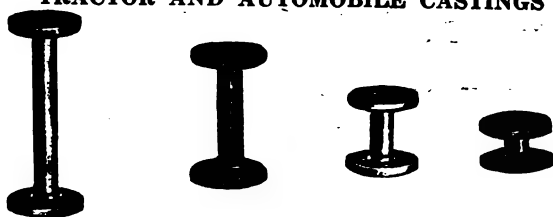
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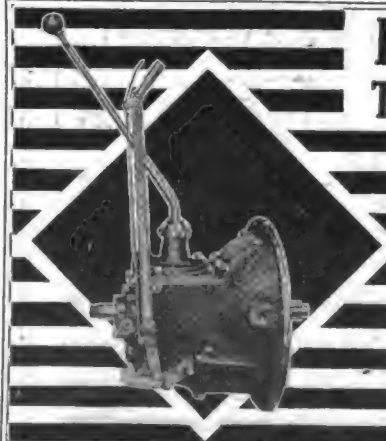
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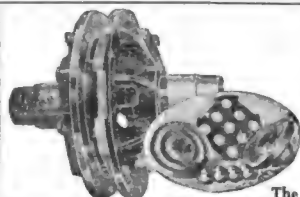
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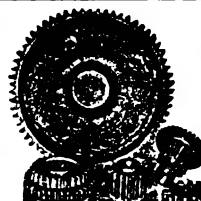
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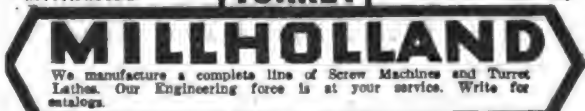
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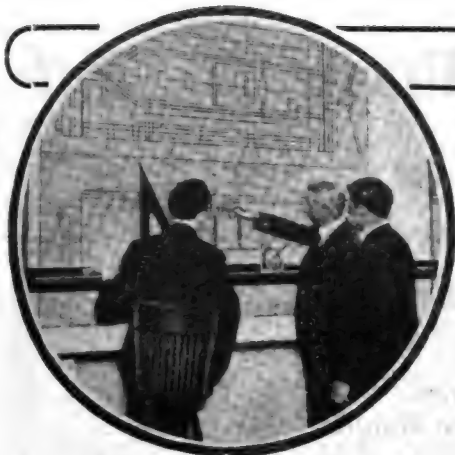
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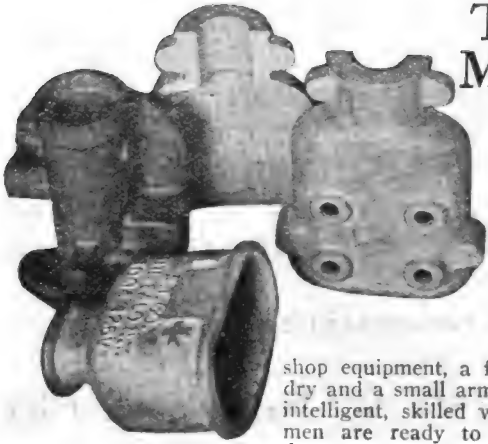
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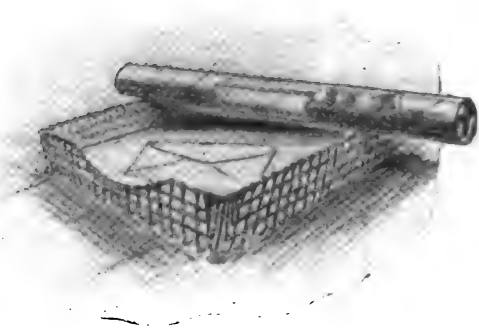
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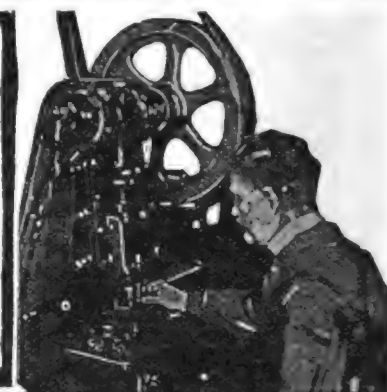
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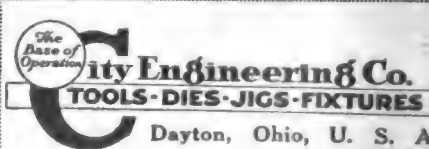
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CONTRACT WORK

Manufacturing and Merchandising Opportunities

The items appearing in these columns form a part of the inquiries received by our Contract Work Service Department during the past three weeks. Manufacturers or concerns interested in these or similar inquiries can secure full information as to how this service is operated by communicating with the Contract Work Service Department, Automotive Industries, 239 W. 39th Street, New York City.

6435 A correspondent located in South Carolina has invented a simple device for keeping Ford starting cranks up out of the mud. It is inexpensive to manufacture, being entirely of metal; would like to get in touch with reliable manufacturer who will handle it on a royalty basis or otherwise.

6436 A New Jersey inventor has brought out a snow and ice plow to be attached to a tractor, automobile or railroad car; also a handle tool as shovel. He desires to get in touch with a railroad or traction company who will take over this device on a royalty basis.

6437 Interest back of this inquiry has patents pending on a radiator preheating and thawing-out device to keep a constant even temperature, and if frozen will thaw out quickly from exhaust. Would like to get in touch with automobile or radiator manufacturers who will take this up on a royalty basis or will consider any satisfactory arrangement.

6438 This party has patents pending on a water preheating device to supply hot water heat in enclosed cars from the exhaust. A simple and inexpensive system; can be secured on a royalty basis.

6439 Interest back of this inquiry has patents since 1916 on a quick detachable tire rim which requires no tools nor expert to change a tire; can be changed in a few seconds. Will consider royalty basis arrangement or otherwise.

6440 A New York correspondent has patented a valve mechanism for internal combustion engines and would like to get in touch with a reliable concern or individual who will have this device manufactured on a royalty basis.

6441 A Western correspondent has patented a combined gas saver and primer for automobiles. Connections are desired with a concern or individual who will manufacture this article on a royalty basis.

6442 Interest back of this inquiry has obtained a patent on a tri-car which was designed and built four years ago; 100" wheel base, 48" tread, underslung frame, 2 1/2" x 4", 4 cyl.; motor three speed and reverse transmission, speed 70 miles per hour. This individual would like to make royalty basis arrangements or will consider other terms.

6443 A correspondent located in Iowa has patent pending on a tool for repairing Ford transmission drums, and would appreciate getting in touch with manufacturers who are in a position to do sheet metal and stamping work.

6444 Interest back of this inquiry has invented an automobile wheel lock, chock or shackle which is fully covered by patent claims; would like to get in touch with a big concern that will assume exclusive control of this device on a royalty basis arrangement or will consider reasonable terms.

6451 A foreign correspondent has brought out an auto accessory which is claimed to be both simple and meritorious; as he has not the facilities to manufacture, he would like to get in touch with a concern that will co-operate in the manufacturing of this device.

6452 A correspondent located in New Jersey has invented a device to lock an automobile robe and prevent its being stolen from the car. This is simple to manufacture and it employs as a locking element a standard cylinder lock of Yale or similar type. This party desires to get in touch with a concern or individual that will manufacture and sell this device on a royalty basis.

6453 A company located in Iowa needs a large number of American autumpumps with which to fill orders in the Middle West; at the present time they are unable to supply the demand and will appreciate connections with concerns that will co-operate in manufacturing arrangements. The work is of the automatic machine character; can be turned out fast, at a reasonable cost.

6454 A western correspondent has invented an Auto Pump—operated by foot or hand from running board until pressure is so great that more weight is required. Wishes to get in contact with some concern that will take it over on a royalty basis or other satisfactory arrangements.

6455 An inventor located in Pittsburgh has applied for patents on an Automobile Whistle which is claimed to be both simple and practical. This individual would like to get in touch with someone who will co-operate in placing this device on the market or who will handle on royalty basis or other arrangements to be agreed upon.

6456 A New York City company is in market for small Malleable Iron Castings and desires to get in touch with mill that can book at order for reasonable delivery.

6457 Interest back of this inquiry has patents granted and pending on a combination Shock Absorber and Bumper which is claimed to be meritorious and to add materially to the appearance of car. Manufacturing co-operation is desired.

6458 A correspondent located in Buffalo, New York, is seeking connections as an agent for tractor distribution in South America preferably Uruguay; Argentina or Brazil as territory.

6459 A New York City individual wishes to get in touch with someone with capital who is willing to enter partnership in order to put in practice certain ideas and various inventions.

6460 An inventor located in Iowa has patented a Liquid-Fuel-Lock device and seeks manufacturing co-operation either on a royalty basis or any satisfactory arrangements.

6461 Interest back of this inquiry has been granted patents on an Automobile Spring Lubricator. Would like to get in touch with some concern who is in a position to market this device either on a royalty basis or special arrangements to be agreed upon.

6462 A Pacific Coast company has invented a Brake-System for motor vehicles and trailers, etc. This device has equalizing arrangement which will either eliminate or reduce skidding and increases equal wear of tires. Manufacturing and marketing co-operation is desired.

6463 Interest back of this inquiry has obtained a patent on an Automobile Engine Mechanical Starter, which is being manufactured on a small scale. Co-operation is desired in order to increase manufacturing and marketing facilities.

6464 A correspondent who resides in Pennsylvania has patented a Tractor Hitching implement. This device is made of steel and will enable a tractor to handle heavy farm implements. It is offered on a royalty basis.

6465 Interest back of this inquiry has invented an interesting Auto. Direction Signal. Will consider royalty basis arrangement or any reasonable offer.

6466 A western correspondent has invented a Cylinder Cleaning device for the prevention and removing of carbon by the use of coal oil or any other fluid desired. This individual would like to get in touch with a reliable concern who will manufacture on a royalty basis or will consider any reasonable arrangements.

6467 An inventor residing in Minnesota has a patent pertaining to a Demountable Wheel Rim that has been tested out satisfactorily and which seems to be both practical and simple. This individual seeks financial assistance or some one who will manufacture on a royalty basis or other satisfactory arrangements.

6468 Interest back of this inquiry has three different Auto Accessories, patents applied and pending. Would like to sell all three on a royalty basis. The devices are as follows: 1. A Steering Wheel. 2. A Vehicle Wheel Lock. 3. A Car Identification System.

6469 A company located in Ohio has patents pending on a Cylinder Lapping Tool for grinding or resurfacing cylinders and has particular application to internal combustion engine cylinders. This concern would like to get in touch with a manufacturer who will consider taking over this patent for production or will consent to have it manufactured on a royalty basis.

6470 A Michigan company is seeking concerns that can manufacture cylinder block castings for them.

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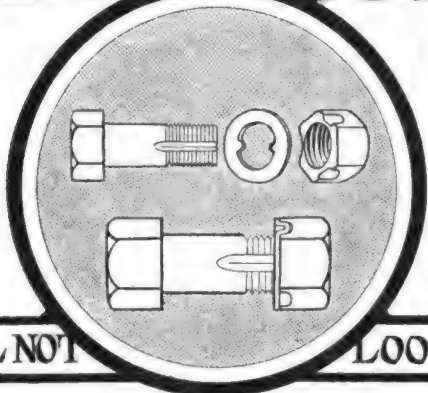
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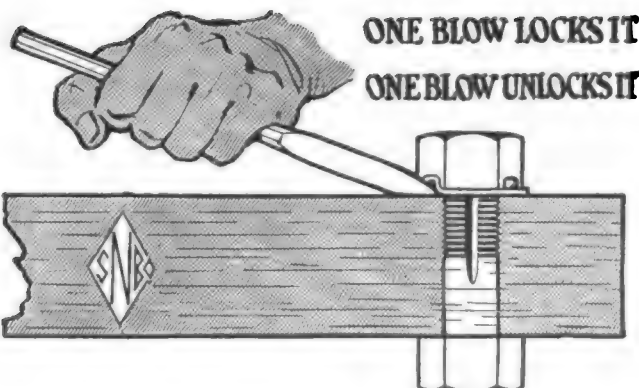
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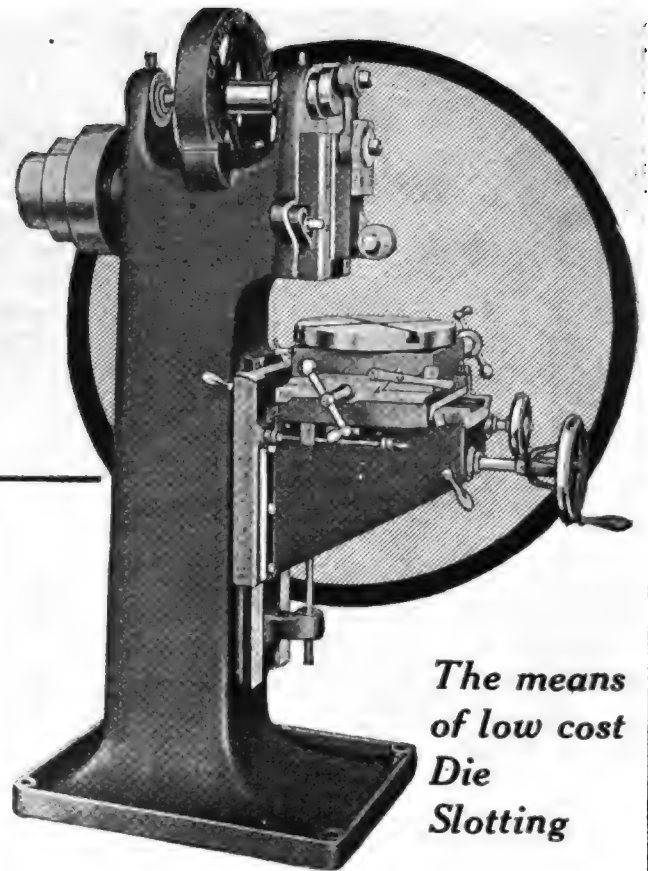
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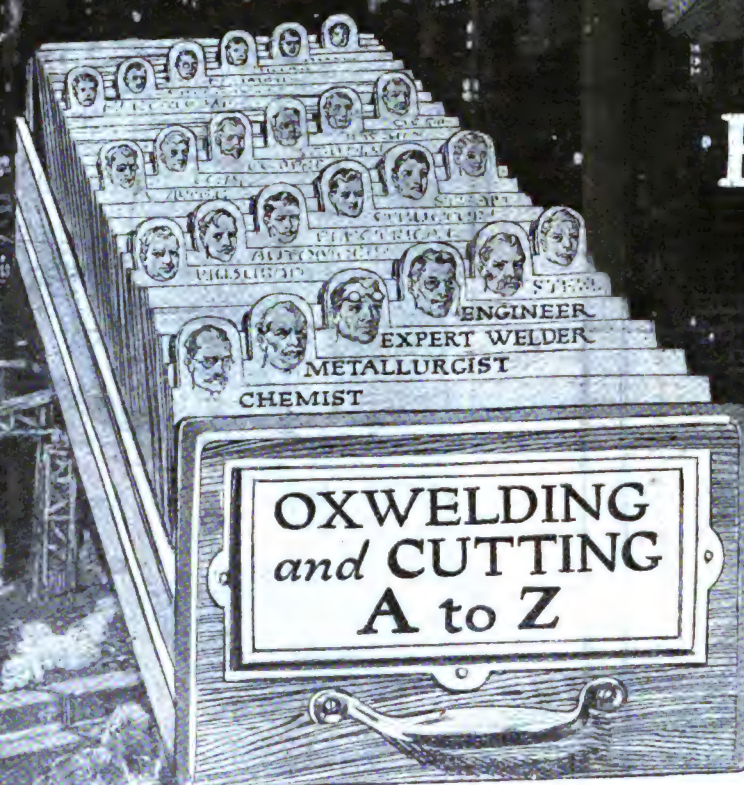
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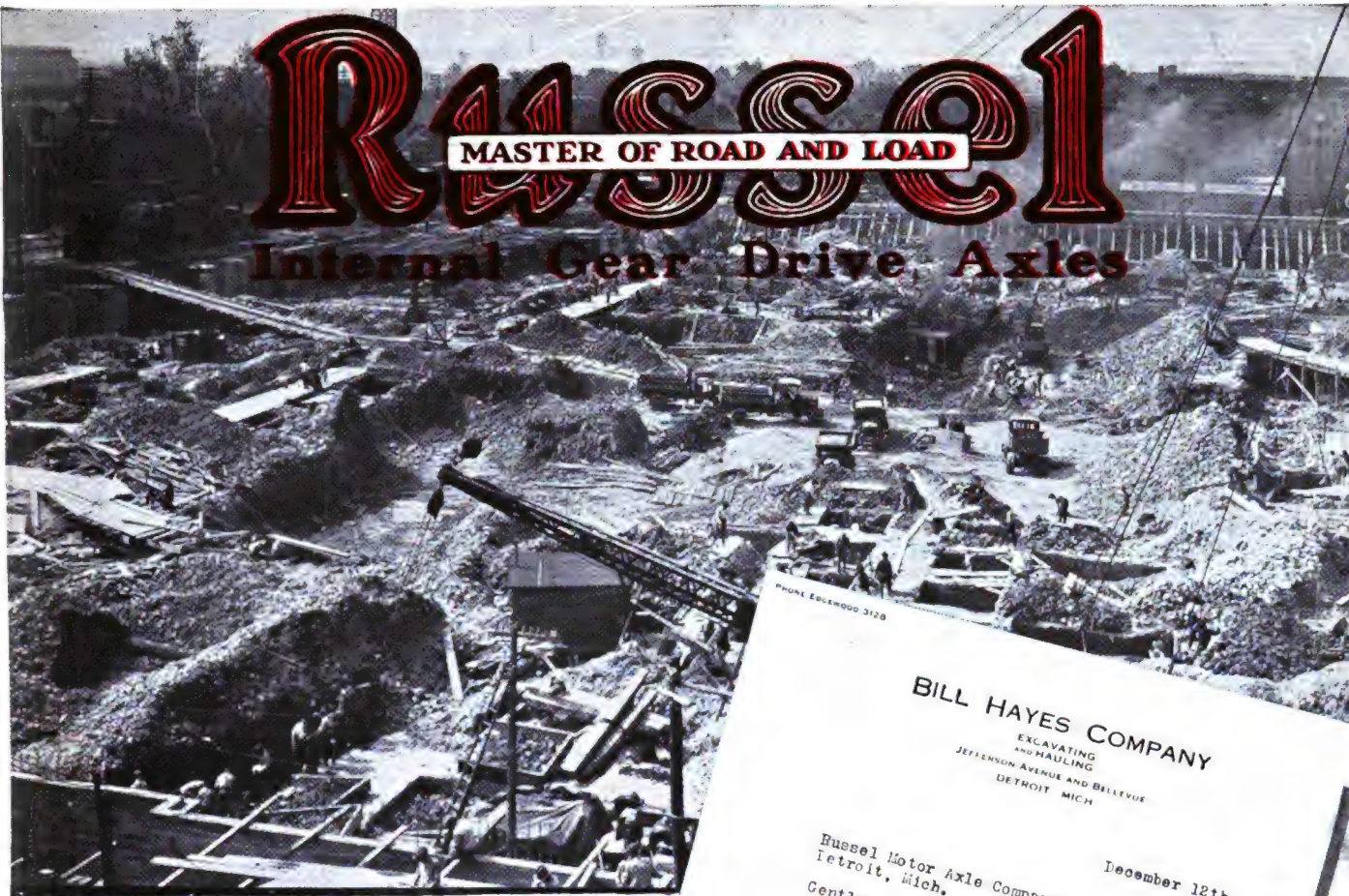
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DETROIT, MICHIGAN

BILL HAYES COMPANY
EXCAVATING
AND HAULING
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Detroit, Mich.

December 12th. 1919.

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or nut in your Irive Axle. As a result
of this unusual service you may be pleased
to know that I have just placed an order
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Bill Hayes





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Goodrich Tires

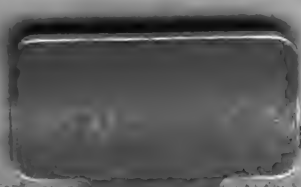
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